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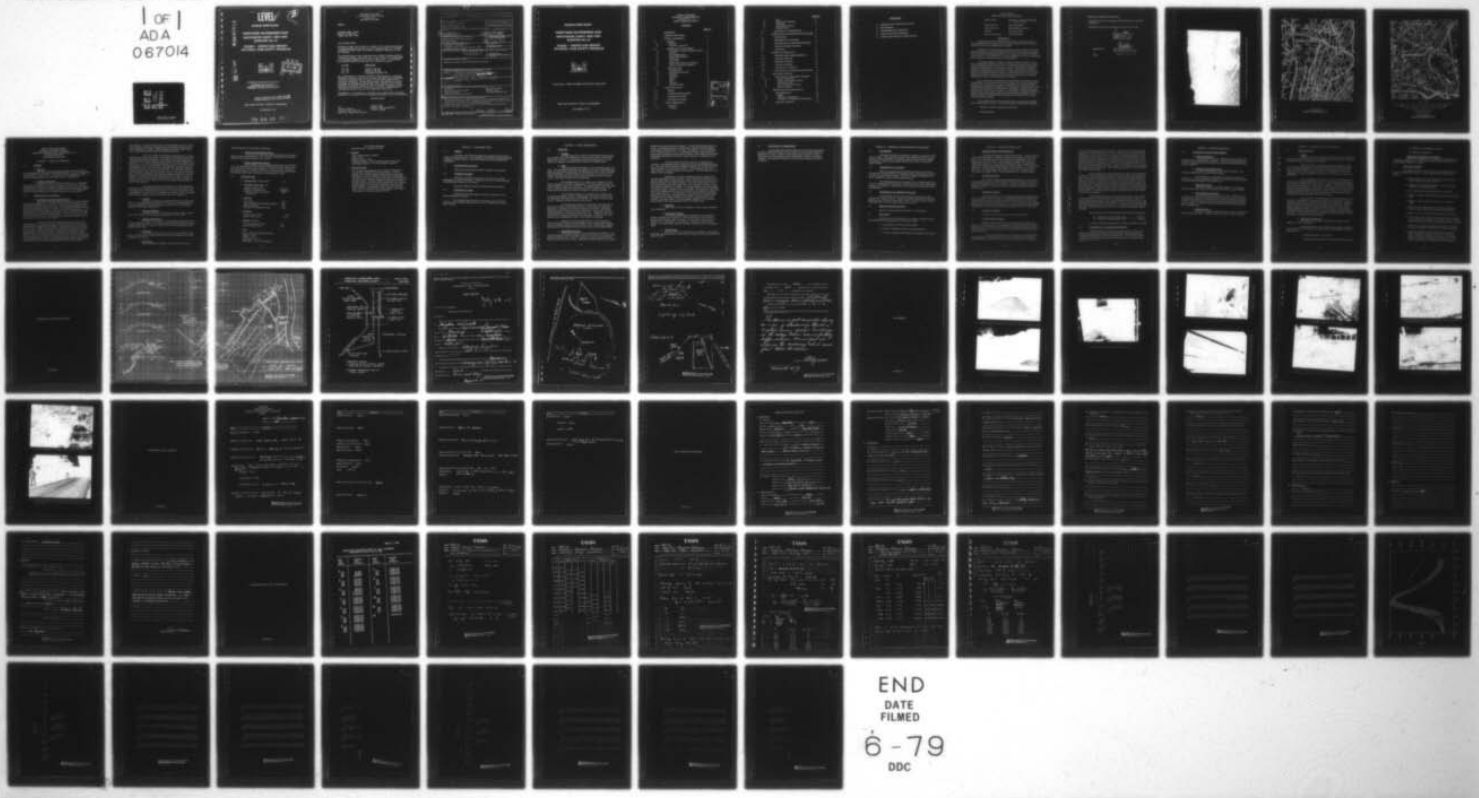

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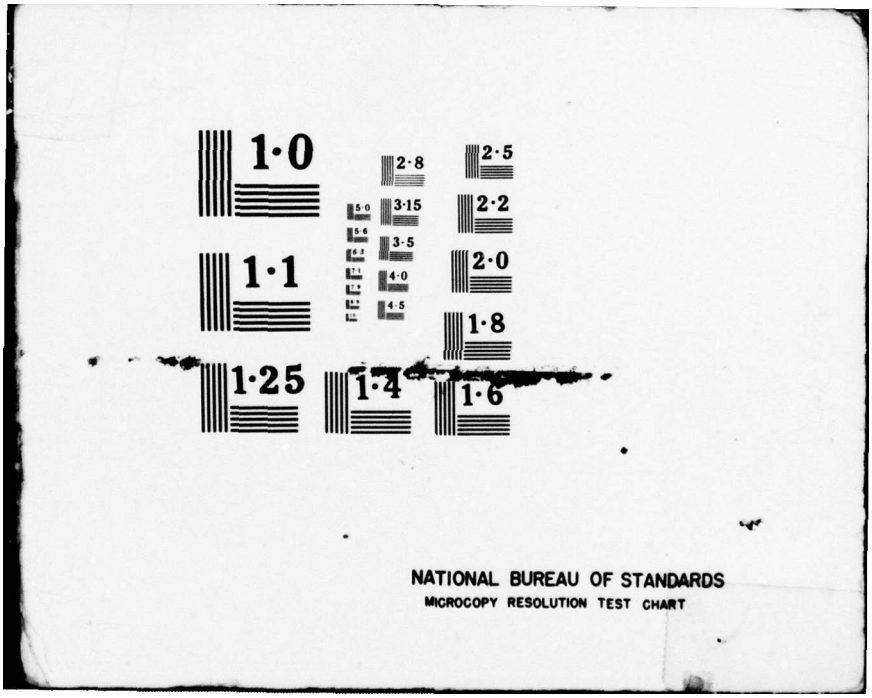
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HUDSON RIVER BASIN

TARRYTOWN WATERWORKS DAM
WESTCHESTER COUNTY, NEW YORK
INVENTORY NO. 54

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

CONTRACT NO. DACW-51-78-C-0024

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NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1978

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, NEW YORK
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

NANEN-P

Honorable Hugh L. Carey
Governor of New York
Albany, New York 12224

Dear Governor Carey:

Reference is made to my letter of 2 October 1978 in which clarification of the guidelines used by this office in assessing dams with "seriously inadequate spillways" under the National Program of Inspection of Dams was outlined.

The following dams in your state have been assessed as having seriously inadequate spillways, with capability to pass safely only the percentage of the probable maximum flood as noted in each report. In accordance with revised criteria they are now to be assessed as unsafe:

I.D. NO.	NAME OF DAM
N.Y. 345	Pleasure Lake Dam
N.Y. 670	Myosotis Lake Dam
N.Y. 54	Tarrytown Waterworks Dam

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

Consequently, it is advisable to implement the recommendations previously furnished in the reports for the above-mentioned dams as soon as practicable.

Sincerely yours,

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

cc:
Barbero, Descenza
Iarrobino (NAD), Exec Ofc
Engrg File, George Koch, NYS DEC

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Tarrytown Waterwork Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.
Tarrytown Waterworks Dam was judged to be unsafe-non-emergency due to a seriously inadequate spillway.

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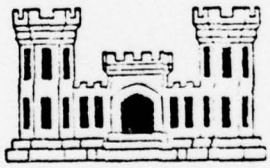
HUDSON RIVER BASIN

TARRYTOWN WATERWORKS DAM

WESTCHESTER COUNTY, NEW YORK

INVENTORY NO. 54

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



Prepared by: TIPPETTS-ABBETT-McCARTHY-STRATTON

NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1978

HUDSON RIVER BASIN
TARRYTOWN WATERWORKS DAM
INVENTORY NO. 54
PHASE I INSPECTION REPORT

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B. PHOTOGRAPHS

C. ENGINEERING DATA CHECKLIST

D. VISUAL INSPECTION CHECKLIST

E. HYDROLOGIC DATA AND COMPUTATIONS

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	TARRYTOWN WATERWORKS DAM (I.D. NO. 54)
State Located:	NEW YORK STATE
County Located:	WESTCHESTER COUNTY
Stream:	SAW MILL RIVER
Date of Inspection:	29 AUGUST 1978

ASSESSMENT

Examination of the available documents and visual inspection of the Tarrytown Reservoir Dam and appurtenant structures did not reveal any conditions which are considered to be unsafe.

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 13 percent of the PMF, and 27 percent of the SPF. The spillway is, therefore, adjudged as seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

It is, therefore, recommended that within three months from the date of notification to the Governor of the State of New York, owners engage the services of a professional consultant to determine by more sophisticated methods and procedures the adequacy of the spillway. Within twelve months of the date of notification to the Governor, appropriate remedial mitigating measures should have been completed. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

No remedial measures are required to assure the safety of the dam at the present time; however, certain measures are recommended regarding:

- Repairs to gatehouse facilities and bridge

- Repair of riprap

- Removal of vegetation from the dam

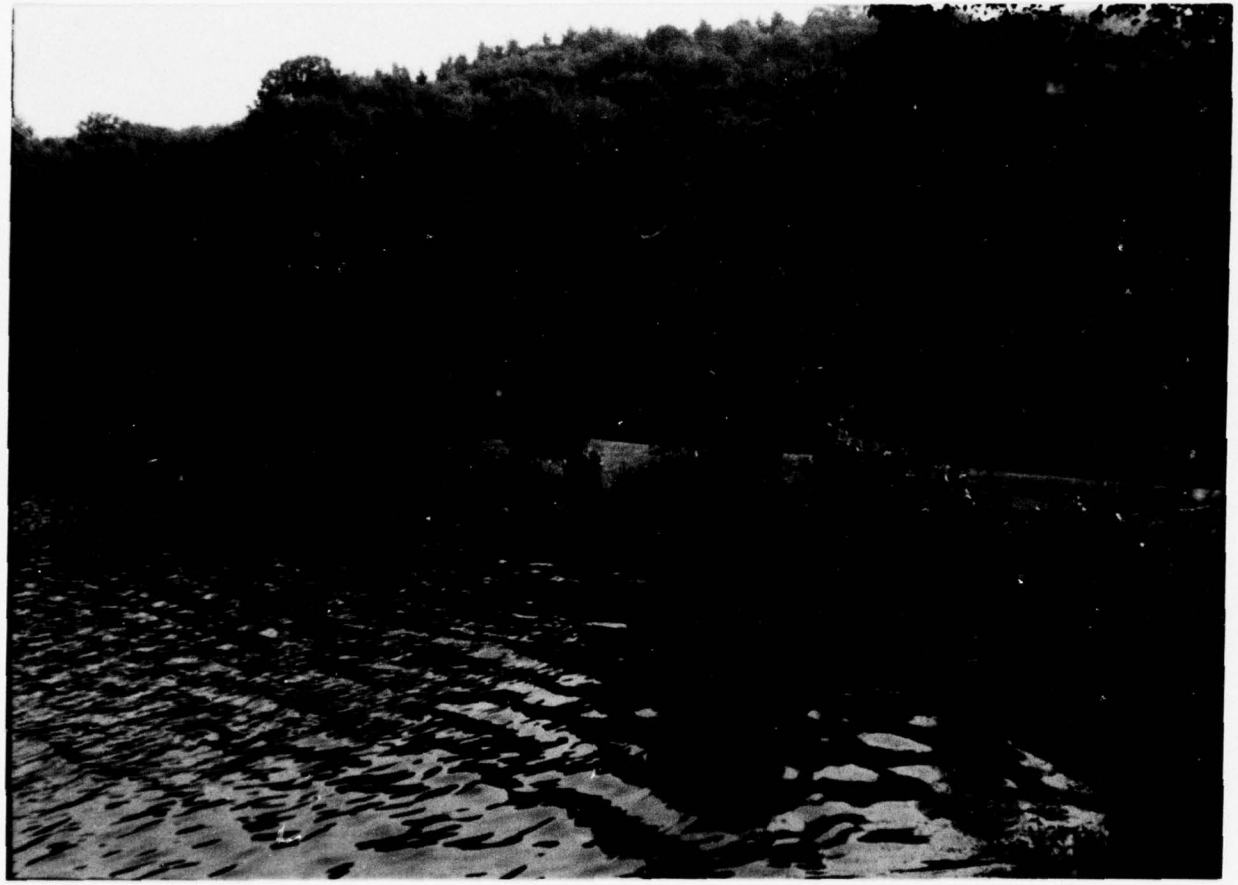
- Preparation of an O & M manual and establishment of periodic inspections

- Monitoring of wet zone downstream of the toe of the dam

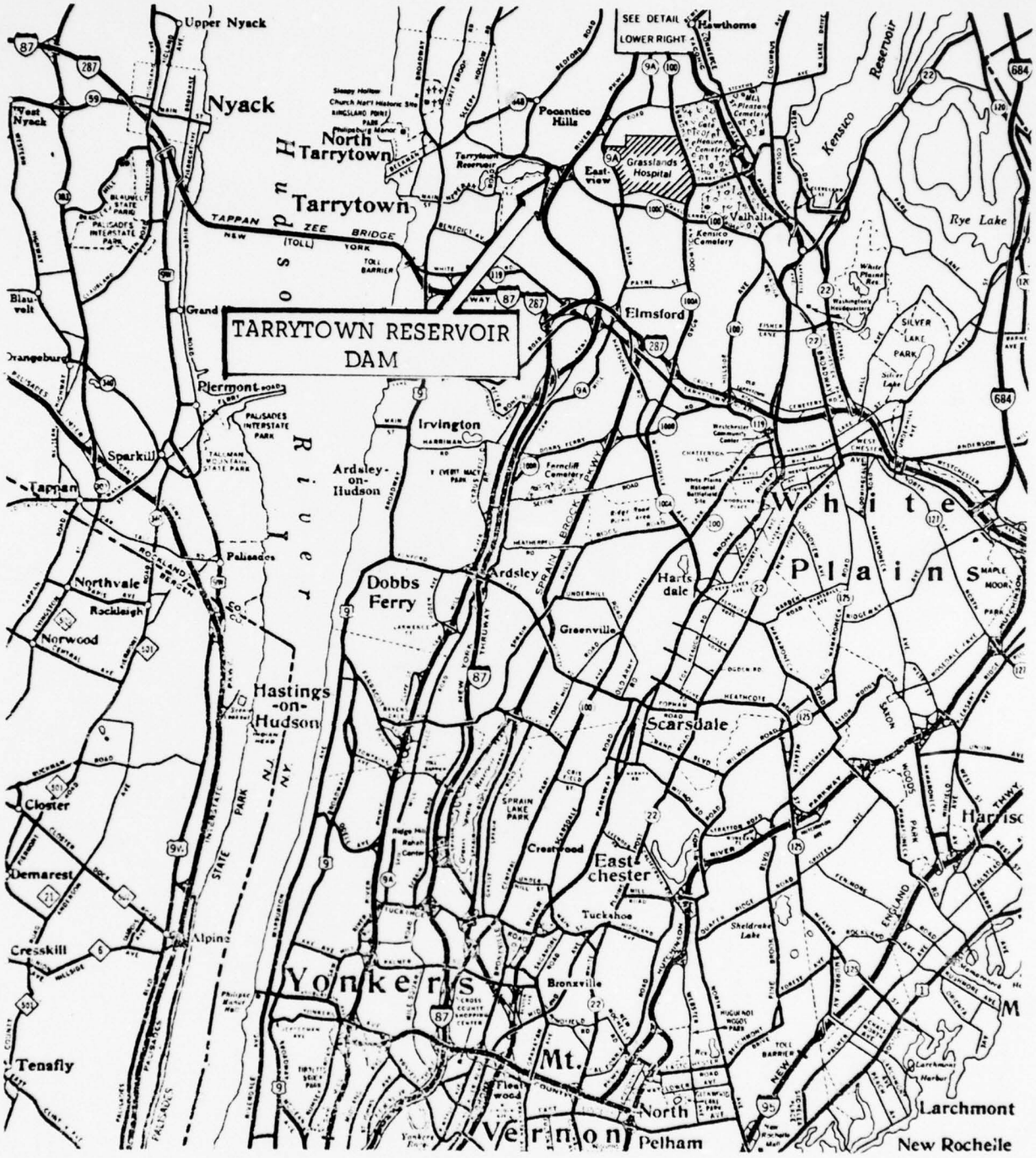
Eugene O'Brien, P.E.
New York No. 29823

Approved by: Col. Clark H. Benn
New York District Engineer

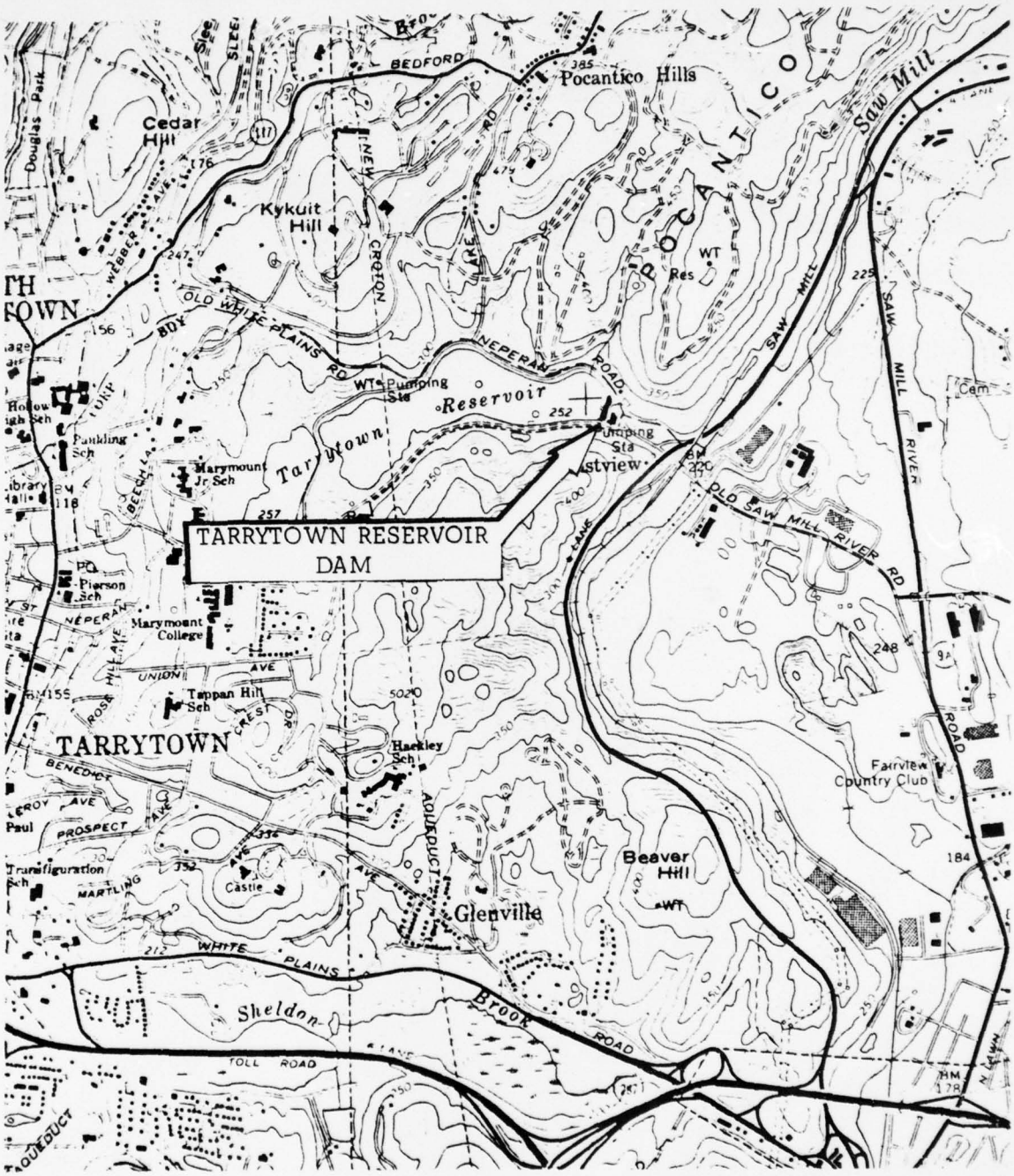
Date: 1978 November 22



1) GENERAL OVERVIEW OF UPSTREAM SLOPE OF DAM AND GATE HOUSE



VICINITY MAP
TARRYTOWN RESERVOIR DAM



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CONTOUR MAP
TARRYTOWN RESERVOIR DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TARRYTOWN RESERVOIR DAM, INVENTORY NO. 54
HUDSON RIVER BASIN
WESTCHESTER, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS by letter dated 31 March 1978, in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1976.

b. Purpose of Inspection

The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: identify deficiencies and hazardous conditions; determine if they constitute hazards to human life or property; and notify the State of New York of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF THE PROJECT

a. Description of Dam and Appurtenances

Tarrytown Waterworks Dam is a 300-foot long earth embankment with a maximum height of about 18 feet above the downstream toe and a crest width varying from 15 to 22 feet. The horizontal alignment of the dam, which generally trends north-south, is "doglegged" at about 160° with the north leg being the spillway, and the south leg, the embankment. The dam contains a 26.5-foot high solid masonry core wall which is 4 feet and 6 feet wide at the top and base respectively. The core wall ends 3.5 feet below the crest of the dam. The upstream and downstream slopes are 1 (V) on 3 (H) and 1 (V) on 2 (H), respectively.

A stone masonry and concrete spillway is located at the north abutment. The spillway crest is 58 feet long and about 2 feet wide. The spillway is capped with two steps of concrete having a total height of about 2.5 feet. Below the concrete is a curved stone masonry chute about 4.5 feet high. Flanking both sides of the spillway are masonry training walls about 32 feet long and having a height above the spillway crest of about 2.5 feet. The spillway crest is located 24 feet from the upstream end of the training walls. Two stone masonry walls are located in the approach channel upstream of the crest. The downstream ends of these walls serve as supports for a wood decked steel pedestrian bridge which crosses

the spillway. The downstream channel of gneiss bedrock is about 75 feet long, narrows to 7 feet at a measuring weir, and passes through an arch into an underground conduit. Water passing through this conduit flows into a small creek which empties into the Saw Mill River.

An 18- by 16-foot stone masonry gatehouse and a 12-foot diameter brick-lined gate chamber are located on the upstream slope about 160 feet from the south abutment. The gatehouse contains manual floor stands at El 255.2 which regulate 6 gate valves in the gate chamber below at El 230. Four 12-inch gate valves regulate the low level intake into the gate chamber, one 24-inch diameter valve regulates the outflow into the underground conduit; and one 24-inch diameter valve regulates emergency low level flows into the main water supply line. An emergency low level intake pipe also enters the gate chamber; however, this pipe has been capped. The 24-inch diameter water supply line passes adjacent to the gate chamber and flows directly into the pumping station located at the toe of the dam. Intake into the water supply line is from the upper screened 12-foot section of a 24-inch diameter 55-foot high intake structure (well) located in the reservoir.

The Tarrytown Reservoir is divided by a road embankment. The upper lake is approximately five feet higher than the lower lake, which is formed by the Tarrytown Waterworks Dam. The top of the dividing dike is estimated to be at El 260±; it is reported that a small conduit, not visible from the dike, controls flow from the upper lake to the lower lake.

b. Location

The dam is located on an unnamed tributary of the Saw Mill River. It is approximately one quarter of a mile west of the Eastview exit of the Saw Mill River Parkway and about one mile north of the downtown section of the Village of Tarrytown.

c. Size Classification

The dam is less than 40 feet high and has a reservoir less than 1000 acre-feet and is therefore classified as a "small" dam.

d. Hazard Classification

The dam is in the "high" hazard potential category because a large corporate complex, a large utility complex and the main water supply pumping station for the Village of Tarrytown are located immediately downstream from the dam.

e. Ownership

Tarrytown Waterworks Dam is owned by the Village of Tarrytown. The day-to-day operation and maintenance is managed by the Water Department, Tarrytown.

f. Use of Dam

The impoundment provided by the dam is the main water

storage reservoir for the Village of Tarrytown.

g. Design and Construction History

The dam and appurtenances were designed by the Tarrytown Board of Water Commissioners. The construction was performed and completed by Van Vranken and Duell Inc. in 1897.

h. Normal Operating Procedures

Water releases from the Tarrytown Reservoir over the spillway. The released water flows through the spillway channel emptying into a stream and then into the Saw Mill River. The water supply is removed from the top level of the reservoir by means of the shaft type intake (well). The average water supply requirement is approximately 3 mgd.

1.3 PERTINENT DATA

a. Drainage Area, square miles — 1.4

b. Discharge at Dam Site, cfs

Maximum flood at site	unknown
Maximum regulating gate	inoperable
Ungated spillway, top of dam (El 254.3)	590

c. Elevation

Top of dam	254.3
Top of embankment separating reservoir	260±
Crest of spillway	252
Streambed at centerline of dam	230±

d. Reservoir

Length of pool, miles	.75±
Surface area, acres	81.2±

e. Storage, acre-feet

Crest of spillway (El 252)	890
Top of dam (El 254.3)	1100

f. Dam

Type: Earth with masonry core wall
Length: 300 ft±
Height: 18 ft±
Top width: 15-22 ft
Side slopes: 1(V): 3(H) Upstream

1(V): 2(H) Downstream
Impervious core: Masonry core wall

g. Spillway

Type: Broad crested, ungated
Length: 58 ft
Crest elevation: 252 ft
Upstream channel: masonry approach walls, 50 ft long
Downstream channel: 75 ft long channel in bedrock

h. Regulating Gates

Four 12-inch inlet pipelines with 12-inch gate valves control the flow of water into the gate chamber. A 24-inch pipeline from the gate chamber supplies water to the pumping station. Flow into and out of this line is controlled by a 24-inch gate valve and a 20-inch gate valve at the respective ends of the pipe. The gate chamber is drained by opening a second 24-inch gate valve which regulates flow into a 24-inch blowoff pipeline. The blowoff line empties into the underground conduit. All the above valves, except the 20-inch valve, which is located at the pumping station, are located at the bottom of the gate chamber at El 230.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The design of the dam was made by the Board of Water Commissions of Tarrytown in 1897. The available written design data and drawings consists of a report made in 1915 by the State of New York Conservation Commission.

2.2 CONSTRUCTION RECORDS

There are no construction records available for the project.

2.3 OPERATION RECORDS

There are no records of operation of the low level outlets, maintenance or repair work orders. There does not exist a formal operation and maintenance manual for the project.

A record of reservoir elevation and rainfall are kept daily.

2.4 EVALUATION OF DATA

Information was made readily available by personnel of the Water Department, Tarrytown.

The available data reviewed in conjunction with the visual inspection are considered adequate for this Phase I inspection and evaluation of safety.

SECTION 3 - VISUAL OBSERVATIONS

3.1 FINDINGS

a. General

A visual inspection of Tarrytown Waterworks Dam was made on 29 August 1978. The weather was sunny to partly cloudy, temperature between 75° and 80°F. Last rainfall occurred the previous night. At the time of the inspection the reservoir level was at the spillway crest.

b. Dam

The earth embankment appears to be in generally good condition. The horizontal and vertical alignments of the crest are generally good except for some minor rutting and a few depressions about 3 feet in diameter and 4 inches deep. A shaft located on the crest about 10 feet south of the gatehouse was an access to an alum injection system which is no longer in use. The shaft is covered with a steel plate.

The upstream slope is in generally good condition with no signs of sloughing, erosion or trespassing. The riprap appears sound with stones missing at only a few locations. The upstream slope behind the gatehouse, however, does show signs of erosion with disrupted riprap. The entire slope and riprap are covered with bushes, saplings and trees.

The downstream slope is in generally good condition with no signs of sloughing, erosion or trespassing. The slope is covered with low vegetation (not grass) which has reportedly not been cut since the fall of 1977. Normally the slopes are cut once a year.

A soft damp area, about 200 square feet, was observed at the toe of the dam, at the maximum section, in line with the gatehouse. Reportedly, in periods of dry weather, the area is not damp. During the inspection a small hole was dug in the damp area. After a short period of time had elapsed, no water was noted in the hole. In addition, upon digging the hole, numerous earthworms were observed. These factors tend to indicate that the dampness is due to runoff rather than seepage.

Based on a previous inspection report (1915) the dam is shown to be about 30 feet high at maximum section. Measurements made during the present inspection show a height of only 18 feet which indicates that the area in the vicinity of the toe at tone time must have been filled.

c. Appurtenant Structures

The spillway appears to be in generally fair condition. The concrete capping is in good condition and there is relatively new pointing on the stone masonry chute. There are, however, several loose and missing stones at the bottom of the chute. Several leaks were observed at the contact

between the concrete and stone masonry. A small leak averages about 1 to 3 gpm. A slightly larger leak, located about 7 feet from the south end of the spillway averages about 5 to 10 gpm. In addition, there is vegetation at the contact and on the sill. The upstream approach to the spillway is clear with the exception of some aquatic weeds. These weeds are reportedly periodically destroyed by the use of copper sulphate, a herbecide and an algaecide.

The stone masonry training walls are in generally good condition. The upstream walls, however, do have loose and missing pointing. The walls which support the pedestrian bridge have several loose and missing stones as well as missing mortar. The downstream walls are in good condition, with only minimal loose pointing. The wood decking of the bridge is in poor condition.

Reportedly, the valves located in the gate chamber have not been operated in at least 24 years. Water Department personnel do not operate these valves for fear they may break or that they may not be able to return the valves to the proper positions. The floor stands appear to be in good condition although the wooden floor of the gatehouse is in poor condition and is considered to be unsafe. The access ladder to the gate chamber is severely rusted. Because of these conditions, the inspection of the equipment in the chamber was limited to what could be seen through a hatchway in the gatehouse floor. The condition of the valves could not be assessed although the valve stem extensions show rusted surfaces with metal loss. The bottom of the chamber appears to be silted to a height equal to the bonnets of the gate valves. The gate chamber appears to be in relatively good condition with some dampness noted on the brick walls.

d. Abutments

There were no signs of seepage or other unusual conditions at the abutments.

e. Downstream Channel

The channel immediately downstream from the spillway is heavily overgrown with vegetation. There are blocks of concrete at the bottom of the spillway chute. However, the minor flows which were observed were not impeded by this condition. The channel, further downstream, is a natural creek with only minimal vegetation and no overhanging trees.

f. Reservoir Area

In the vicinity of the dam there is no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the investigation revealed several deficiencies which at present do not adversely affect the adequacy of the dam. However, these deficiencies do require attention and should be corrected before further deterioration leads to a hazardous condition. Recommended measures to improve these conditions are given in Section 7.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal average water release to supply the village of Tarrytown is 3 mgd. The supply water enters at the shaft type intake and flows through a 24-inch pipeline to the pumping station where the water release is regulated. Water is always taken from the top 12 feet of the normal reservoir level.

4.2 MAINTENANCE OF THE DAM

There is no operation and maintenance manual for the project. The reservoir is visited daily by the pumping station personnel who examine the dam and other project features. There is no formally established program of inspection visits by other Village personnel.

The embankment dam is maintained only by periodic yearly mowing of the vegetated slope protection. Maintenance of the earth embankment appears to be adequate. Maintenance of the appurtenant structures is less than adequate.

4.3 MAINTENANCE OF OPERATING FACILITIES

It was reported that the low level gate valves have not been operated for at least 24 years. Operating personnel expressed concern that operating the valves might cause them to break or that the valves could not be brought back to their original position once rotated.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect or in preparation.

4.5 EVALUATION

The operation and maintenance of the Tarrytown Reservoir Dam is considered less than adequate in the following areas:

a. Non-operation of low level outlet gates.

b. Control of vegetation growing on the embankment.

c. No formal operation and maintenance manuals for the project.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE BASIN CHARACTERISTICS

The Tarrytown Reservoir consists of two lakes. For this analysis it was found necessary to separate the basin into an upper and lower sub-basin. The sub-basin for the upper reservoir is approximately 50% urban development and 50% woods. It is rectangular in shape with a length to width ratio of about 0.3. The lower reservoir basin was considered 100% woods with fairly steep slopes and narrow winding valleys. The upper basin area is 261.2 acres and the upper reservoir is 21.6 acres or 8.3% of the basin area. The lower basin area is 567.1 acres with a reservoir area of 59.6 acres (10.5%basin area). Total drainage area is 1.3 square miles.

5.2 SPILLWAY CAPACITY

The reservoir spillway (see description Section 1.2) has a computed discharge capacity of 590 cfs with the water in the lake at El 254.3, which is equivalent to the top of the dam. The reservoir also has a 24-inch diameter, low level outlet pipe (which was reported inoperable) located in the gatehouse.

5.3 RESERVOIR CAPACITY

The normal capacity of the Tarrytown Reservoir is reported to be 2.9×10^8 gallons or 890 acre-feet. The estimated surcharge storage of the lower reservoir between the spillway crest (El 252) and the top of the dam (El 254.3) is about 143 acre-feet or about 3.4 inches of runoff over the lower drainage basin. The surcharge storage of the upper reservoir between normal lake level (El 257) and the estimated dike elevation of 260 is 71 acre-feet.

5.4 FLOODS OF RECORD

There are no records of flow from this drainage area.

5.5 OVERTOPPING POTENTIAL

Because there are no data on Probable Maximum Floods for an area of 1.26 square miles, it was necessary to synthesize a design flood hydrograph for the contributing area; both the Probable Maximum Flood (PMF) and the Standard Project Flood (SPF) were estimated and compared with the spillway capacity.

The Probable Maximum 6 hour rainfall over 10 square miles for the Tarrytown Reservoir area was taken from Weather Bureau sources and distributed in a probable storm sequence as indicated in a publication

of the World Meteorological Organization. Based on the Soil Conservation Services' curve number method, the excess rainfall was determined for both sub-basins. Due to the unusual basin shape, a unit hydrograph for an area assumed to be representative of the entire basin was first developed. This representative unit hydrograph was transposed to each sub-basin and used to compute the PMF hydrograph. The flood inflow for the upper lake was derived by adding the runoff resulting from the excess rainfall on the lake surface to the computed PMF hydrograph. Inflow to the lower lake also included the outflow from the upper lake. The computed peak inflow to the lower lake was 4998 cfs for the PMF.

The potential of the water overtopping the dam was investigated on the basis of the available surcharge storage and spillway discharge capacity to meet a potential emergency inflow. It was assumed that the upper lake was at El 257 and the lower lake at El 252 (spillway crest) at the start of the flood inflow. Outflow from the upper lake was assumed to occur over the road as the conduit below the road was assumed blocked. Outflow from the lower lake is possible through the service spillway. Outflow through the water supply main is small relative to the storm flows and was not included in the analysis. Outflow through the pipes in the gatehouse is not possible as valves are inoperable.

The PMF routed through the reservoirs caused the water surface in the upper lake to rise to El 261.4, 1.4 feet above the dike. The flow over the dike corresponding to this critical situation is about 1572 cfs. The combined inflow to the lower reservoir from the upper lake and from the flood caused the water level to rise to El 256.6, 2.3 feet above the top of the dam. The peak outflow discharge was 4674 cfs, 7.9 times the computed spillway capacity.

The Standard Project Flood (1/2 PMF) resulted in the following:

a) Maximum lower lake level, SPF.....El 255.4
b) Peak lower lake discharge, SPF.....2195 cfs

The peak outflow discharge was 3.7 times the spillway capacity.

5.6 EVALUATION OF HYDROLOGY/HYDRAULICS

Using the Corps of Engineers screening criteria, it has been determined that the dam would be overtopped for all storms greater than 8.5 percent of the PMF and 19 percent of the SPF. The spillway capacity is therefore considered to be seriously inadequate from a hydrologic and hydraulic point of view.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations did not indicate any serious structural problems with the embankment or spillway. The deficiencies described in Section 3 require attention and measures to improve these deficiencies are given in Section 7.

b. Design and Construction Data

No design computations or other data pertaining to the structural stability of the dam have been located.

On the basis of the performance experience, the visual inspection, as well as engineering judgment, the dam and spillway appears to be structurally adequate at the present time.

c. Operating Records

There are no operating records available. It is reported that low level outlet valves have not been operated for at least 24 years.

d. Post Construction Changes

It is reported the dam was built in 1897. There are no records of any construction changes which have taken place since that time. It is reported, however, the spillway and the training walls were repaired in 1974. Loose and missing pointing was repaired and finished flush with the stone masonry. Wooden flashboards were removed and were replaced with a concrete crest.

e. Seismic Stability

The dam is located in Seismic Zone No. 1 and in accordance with recommended Phase I guidelines does not warrant seismic analyses.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 DAM ASSESSMENT

a. Safety

Examination of the available documents and visual inspection of the Tarrytown Reservoir Dam and appurtenant structures did not reveal any conditions which are considered to be unsafe.

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the embankment dam would be overtopped for all storms exceeding approximately 13 percent of the PMF, and 27 percent of the SPF. The spillway is, therefore, adjudged as seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

It is, therefore, recommended that within three months from the date of notification to the Governor of the State of New York, owners engage the services of a professional consultant to determine by more sophisticated methods and procedures the adequacy of the spillway. Within twelve months of the date of notification to the Governor, appropriate remedial mitigating measures should have been completed. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Adequacy of Information

The information and data available were adequate for performance of this investigation.

The information and data available with regards to operation and maintenance of the project is considered less than adequate in the following areas:

1) Record drawings of the project

2) Records of modifications and additions to the spillway

3) Operation and maintenance manuals

4) Records of inspections

c. Necessity for Additional Investigations

Additional investigations are necessary to further evaluate the spillway adequacy and to determine remedial mitigating measures as recommended in Section 7.1a above.

7.2 REMEDIAL MEASURES

No remedial measures are required to assure the safety of the dam at the present time; however, certain measures are recommended as follows:

a) Repair and/or replace the rotted gatehouse flooring and access ladder to the gate chamber.

b) Inspect all surfaces and equipment in the gate chamber and make any necessary repairs.

c) All valves should be made operable and maintained.

d) Repair the missing and displaced riprap along the upstream slope.

e) Repair the rotted and broken planks on the pedestrian bridge.

f) Repair the loose masonry along the training walls and spillway chute, adding new pointing where necessary.

g) Remove the loose concrete blocks from spillway channel.

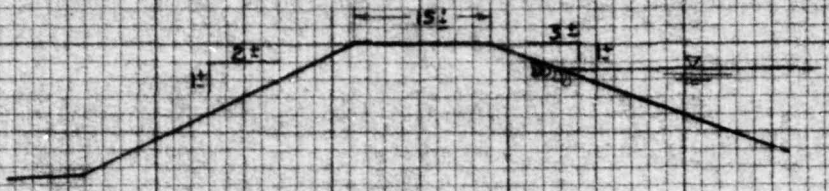
h) Remove heavy brush, shrubs and saplings from all locations on the embankment, spillway and spillway channel. Aquatic weeds should be removed from the spillway approach channel.

i) Prepare an operation and maintenace manual and establish a program of periodic inspections for the project features.

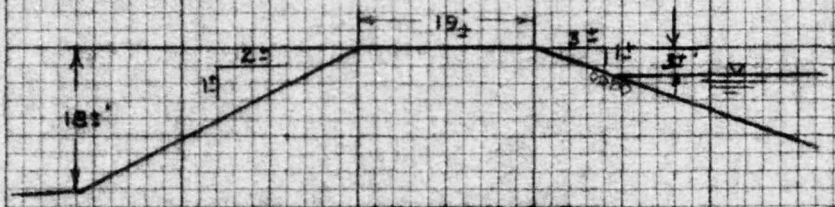
j) Establish a monitoring program to determine whether the zone of dampness described in Section 3 is caused by runoff or seepage. If seepage is the case, a systematic program of observation and monitoring of changes in the pattern and quantity of the seepage should be initiated.

DRAWINGS AND INSPECTION REPORTS

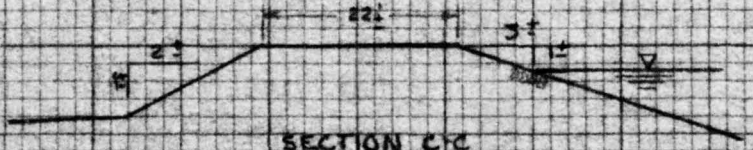
APPENDIX A



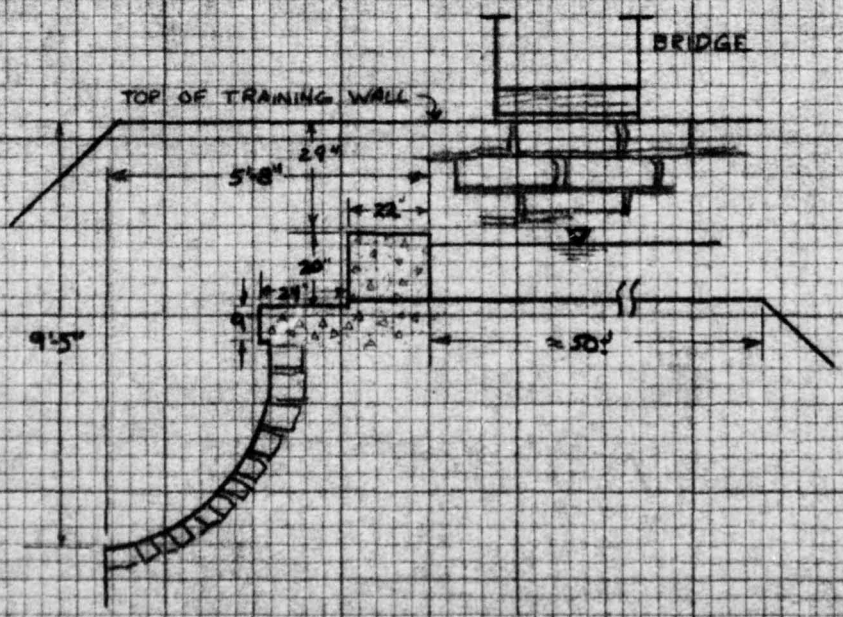
SECTION A-A

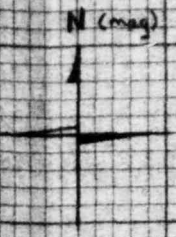


SECTION B-B



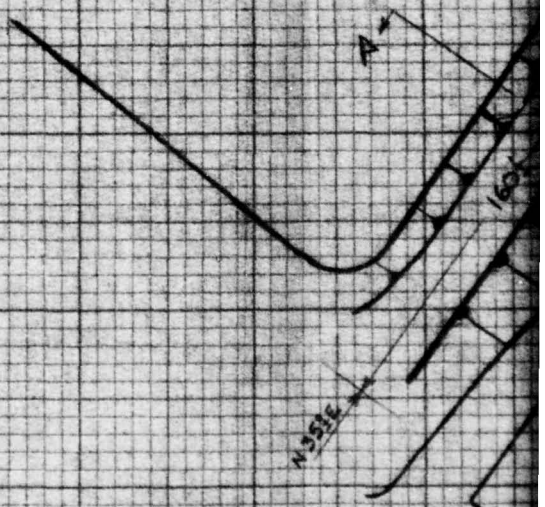
SECTION C-C



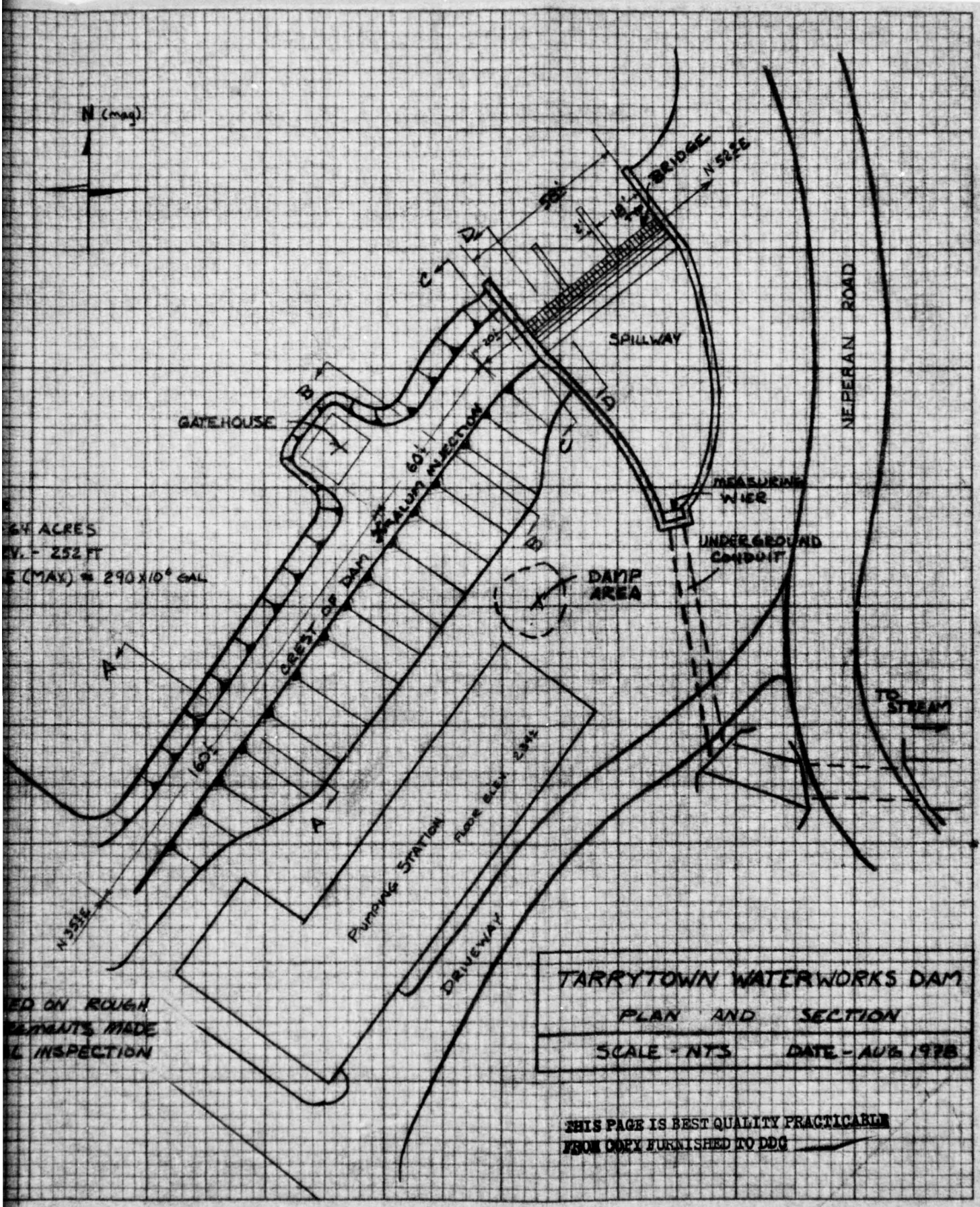


GATE

RESERVOIR
AREA - 64 ACRES
MAX. ELEV. - 252 FT
STORAGE (MAX) = 290 X 10^6 GAL



NOTE: DRAWING BASED ON ROUGH FIELD MEASUREMENTS MADE DURING VISUAL INSPECTION



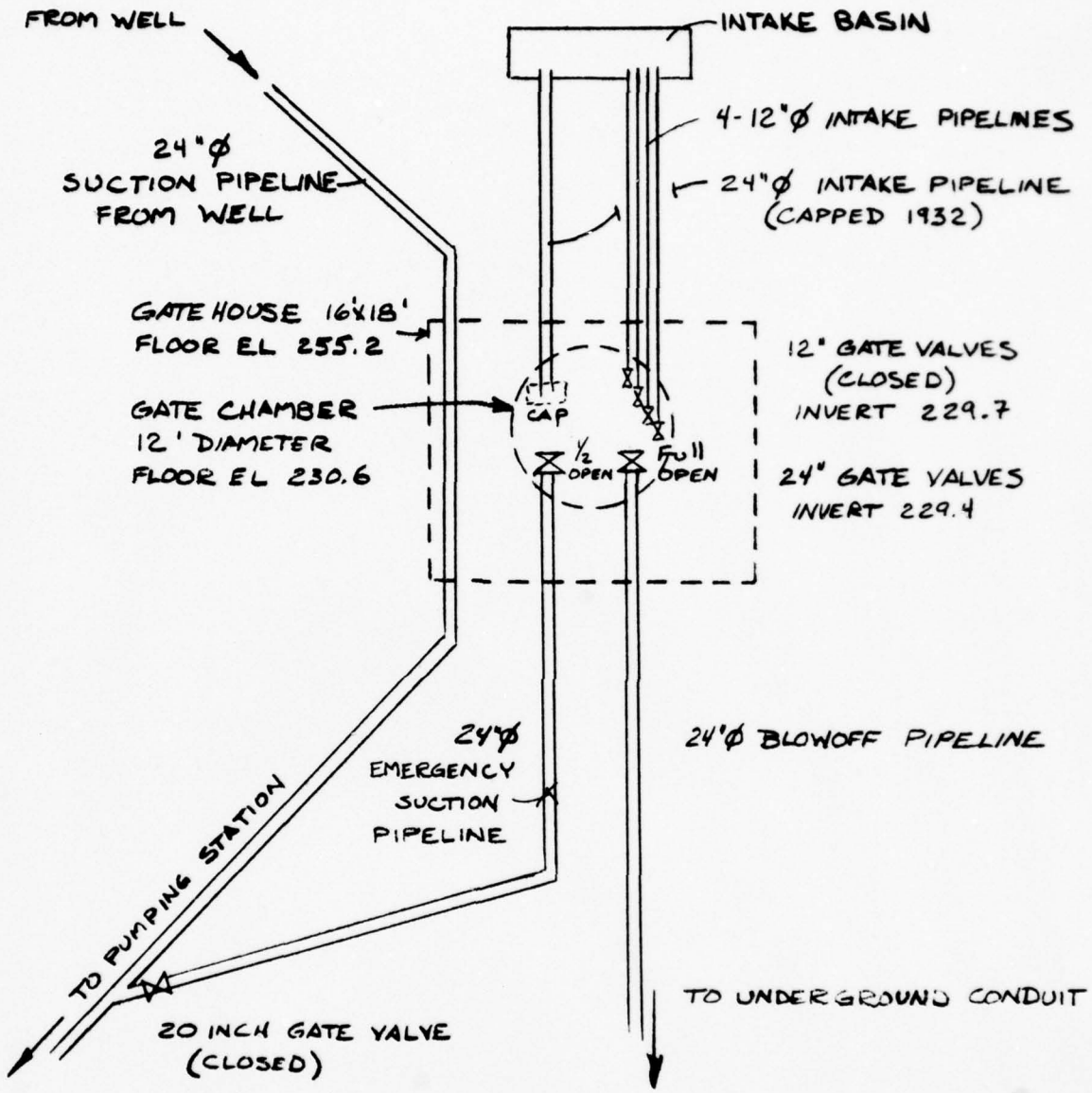
TARRYTOWN WATERWORKS DAM

PLAN AND SECTION

SCALE - NTS DATE - AUG 1978

TARRYTOWN WATERWORKS DAM — SCALE - NTS

GATEHOUSE AND PIPING LAYOUT — AUG 1978



INFORMATION SOURCES

1) WATERLINE LAYOUTS ON VARIOUS STATIONS FIELD BOOK #11 - TARRYTOWN WATER DEPT.

2) GENERAL ARRANGEMENT MAP AT PUMPING STATION

W.W.L. 11-6-14-1000 (16-1035) Acc. 382

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

DAM REPORT

July 16th 1915
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Tarrytown Waterworks Dam.

This dam is situated upon the West Branch of Sawmill River (Give name of stream) in the Town of Greenburg, Westchester County, about 1½ Miles (State distance) from the Village ~~or City~~ of Tarrytown. The distance down (Up or down) stream from the dam, to the Sawmill River R'r'p'e (Give name of nearest important stream or of a bridge) is about 2500 feet (State distance).

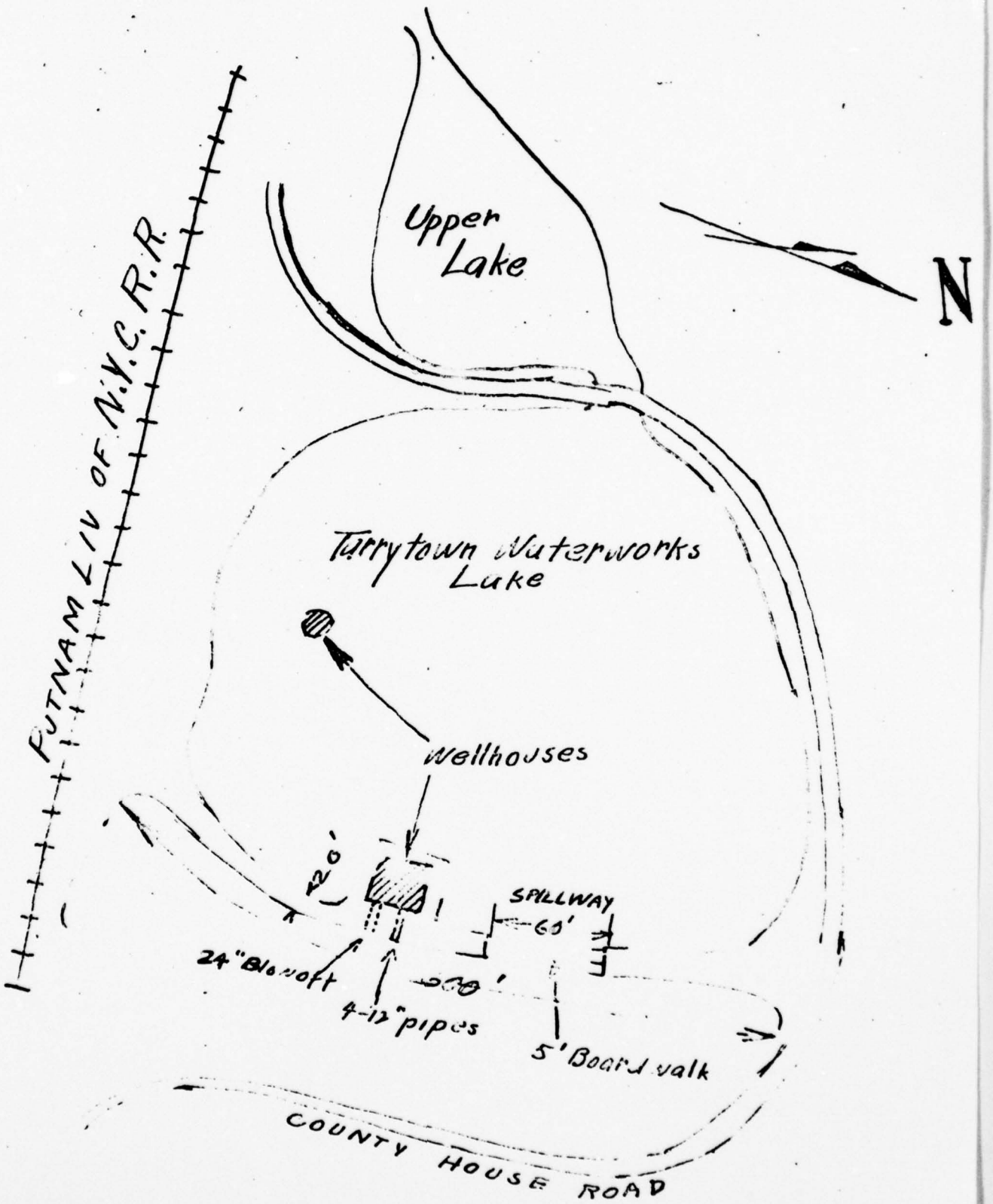
The dam is now owned by Village of Tarrytown (Give name and address in full) and was built in or about the year 1897, and was extensively repaired or reconstructed during the year ——.

As it now stands, the spillway portion of this dam is built of Masonry (State whether of masonry, concrete, earth or timber) and the other portions are built of Masonry core R'f R'p & Earth (State whether of masonry, concrete, earth or timber) up

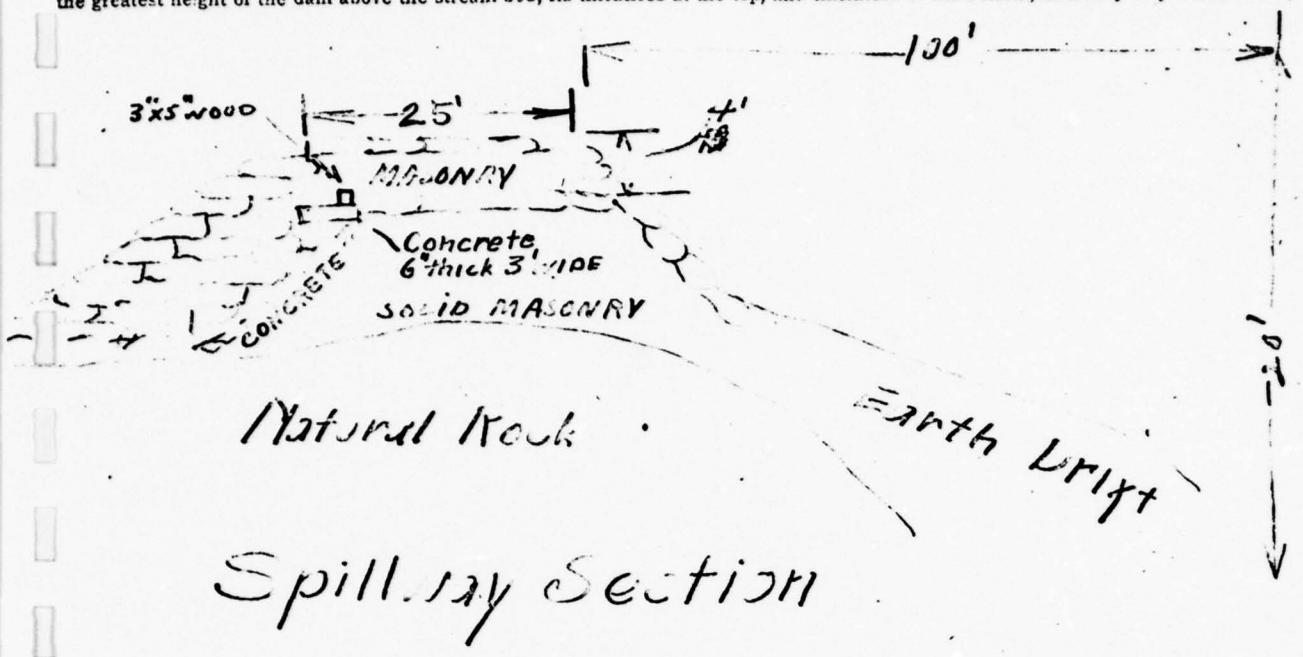
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is Rock and under the remaining portions such foundation bed is Rock and Clay.

Map 214 E

(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.)

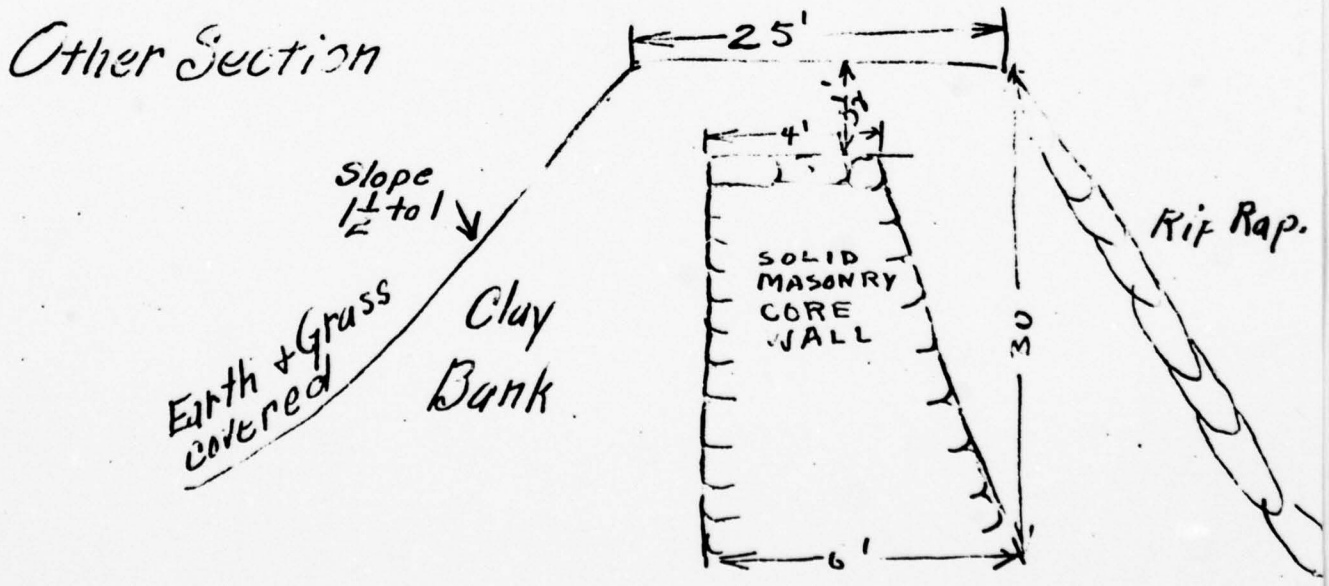


(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)



Spillway Section

Other Section



The total length of this dam is 600 feet. The spillway or waste-weir portion, is about 60 feet long, and the crest of the spillway is about 4 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: 24" Lowell and 4-12" Pipes also a 24" Lead to pump station

At the time of this inspection the water level above the dam was 0 ft. 8 in. below above the crest of the spillway.

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

This dam is in good condition showing no signs of weakening. Should a rupture occur several buildings in the valley below would probably suffer severe damages as well as the roadway which runs just below the dam.

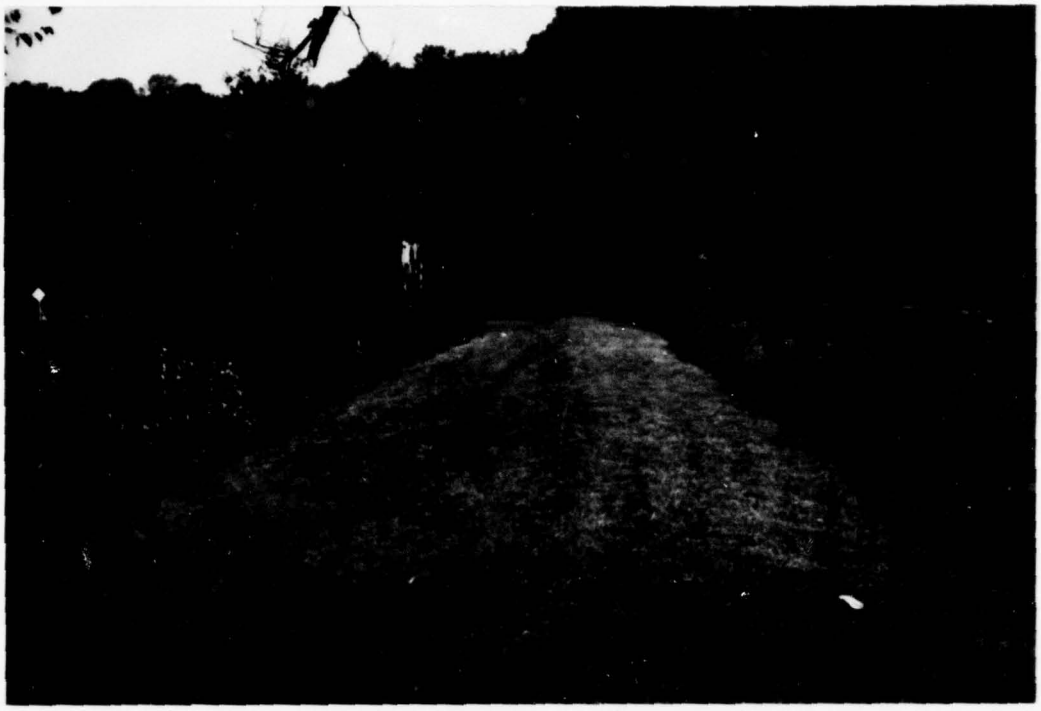
Reported by L D Seymour
(Signature)

(Address - Street and number, P. O. Box or R. F. D. route)

Walcott N. Y.
(Name of City)

PHOTOGRAPHS

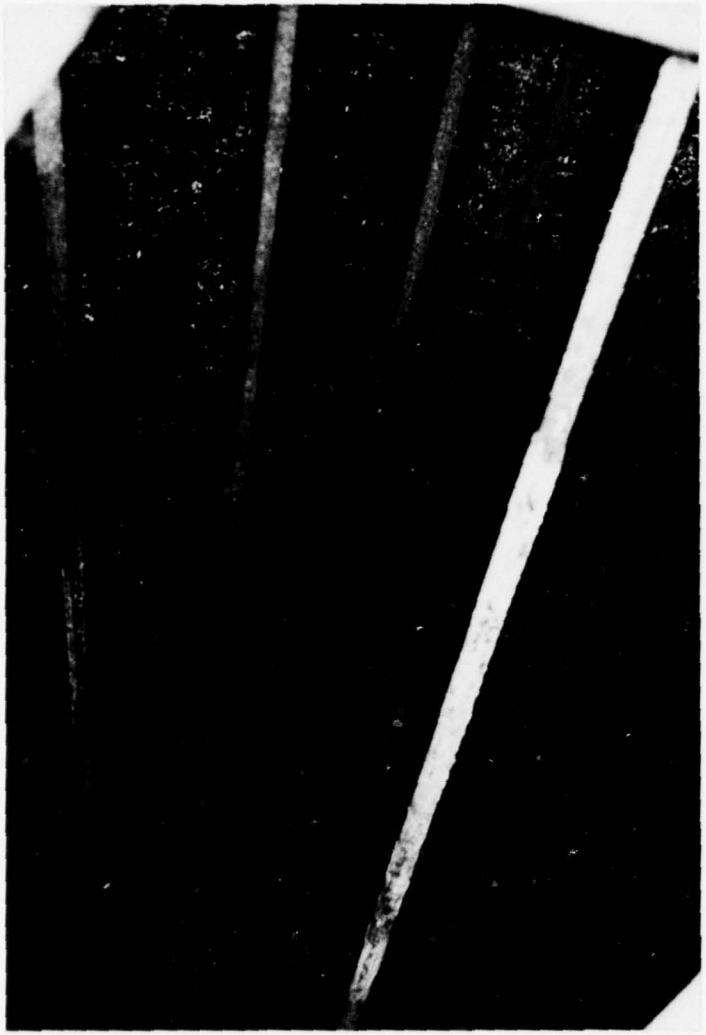
APPENDIX B



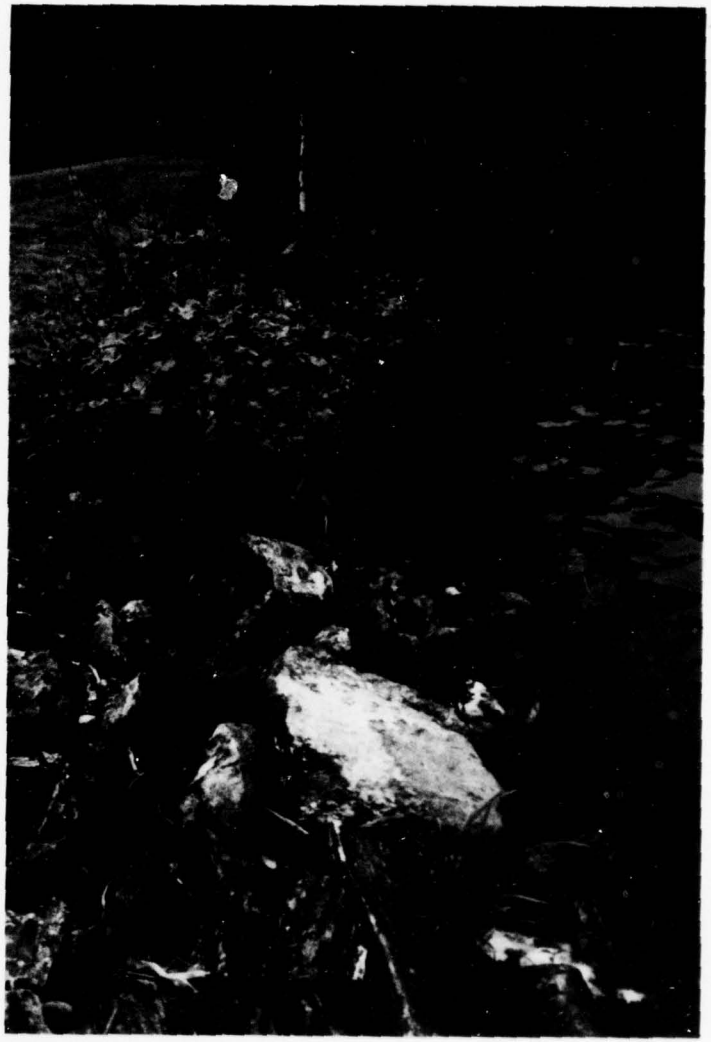
2) CREST OF DAM LOOKING NORTH, NOTE RUT ALONG CENTER OF CREST

3) DOWNSTREAM SLOPE OF DAM LOOKING NORTH

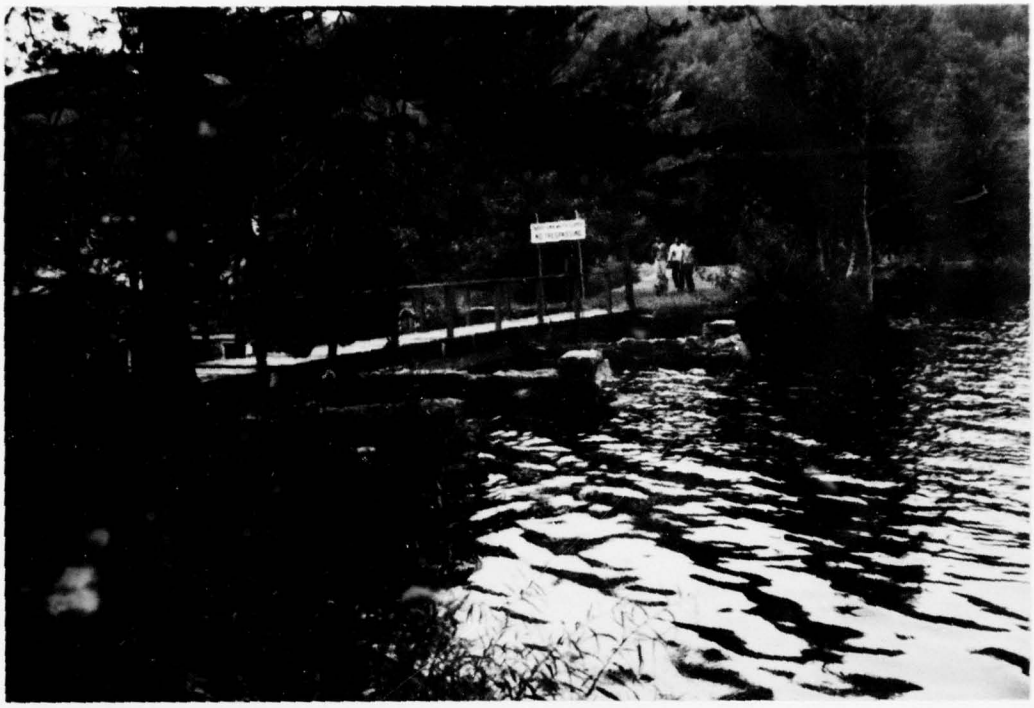
4) VALVE OPERATING STANDS IN GATE HOUSE



5) GATE CHAMBER, NOTE VALVES AT BOTTOM

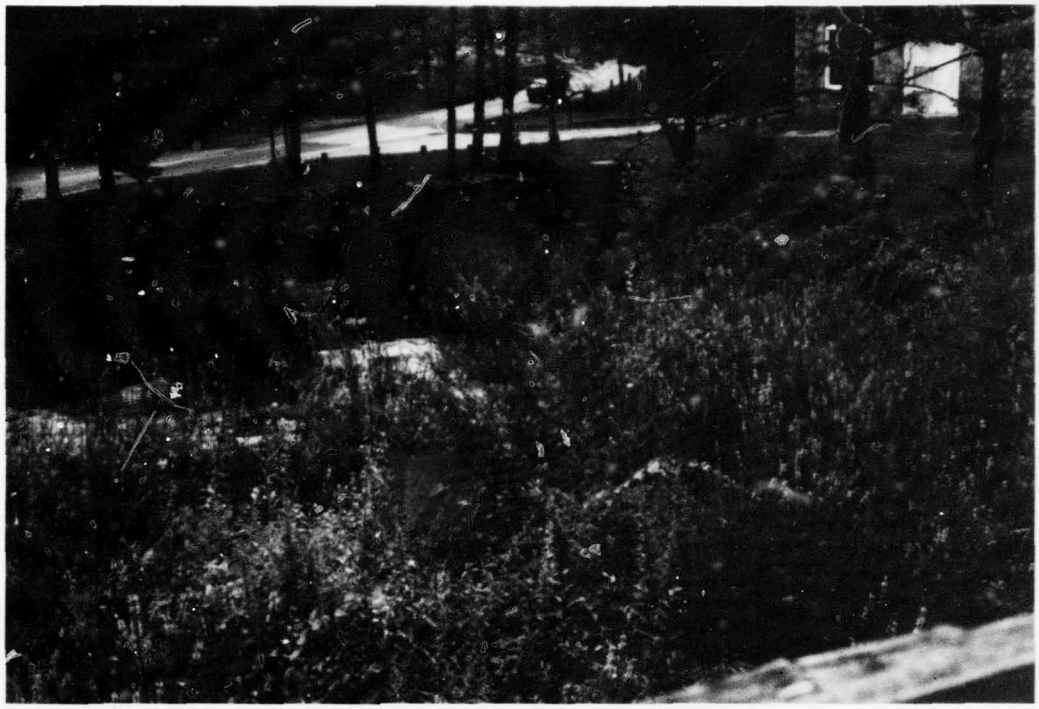


6) RIPRAP ON UPSTREAM SLOPE



7) APPROACH CHANNELS TO SPILLWAY

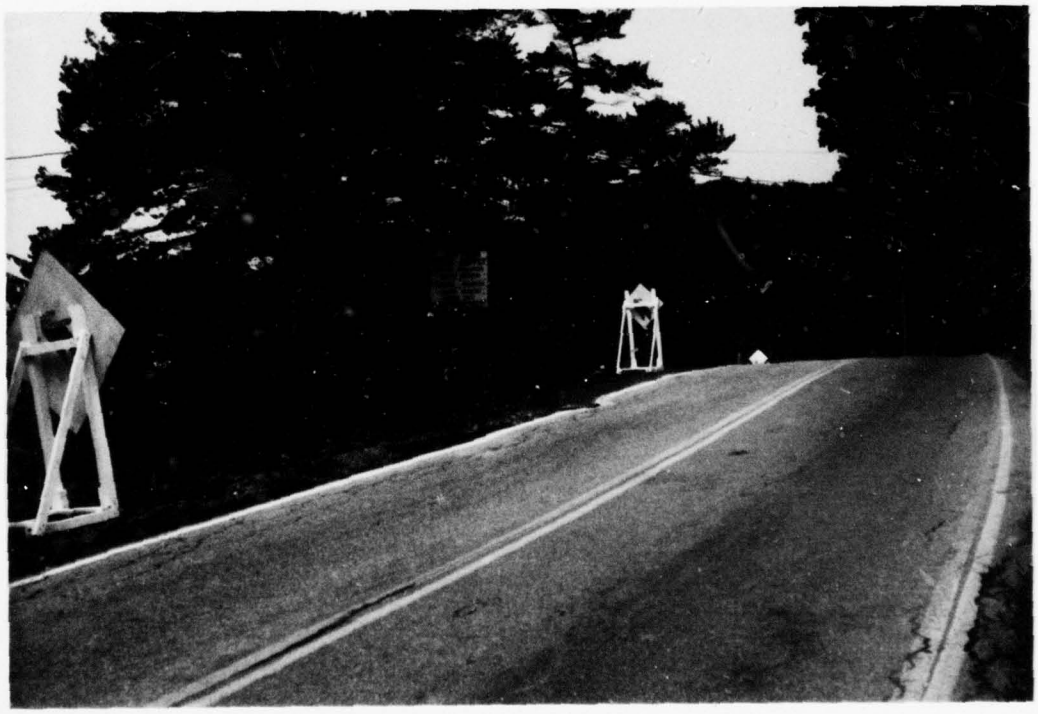
8) SPILLWAY CHUTE, NOTE DISPLACED MASONRY AT CHUTE TOE



9) SPILLWAY CHANNEL LOOKING DOWNSTREAM, NOTE ENTRANCE OF CONDUIT AND HEAVY VEGETATION

10) SPILLWAY CHANNEL LOOKING UPSTREAM

11) ENTRANCE OF CONDUIT, NOTE MEASURING WIER



12) ROADWAY (NEPERAN ROAD) NORTH AND UPSTREAM OF SPILLWAY, NOTE DEPRESSED AREA BETWEEN ROAD AND TARRYTOWN WATER SUPPLY SIGN

ENGINEERING DATA CHECKLIST

APPENDIX C

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Tarrytown Waterworks
ID # 54

ITEM	REMARKS
AS-BUILT DRAWINGS	None
REGIONAL VICINITY MAP	USGS Quadrangle - White Plains, NY
CONSTRUCTION HISTORY	Built in 1897 by Van Vranken & Duell Inc.
TYPICAL SECTIONS OF DAM	Spillway and embankment sections (Conservation Commission - Dam Report, 1915)
OUTLETS-PLAN	Plan of low level outlets copied from Tarrytown Water Dept. Field Book and general arrangement map at pumping station.
-DETAILS	None
-CONSTRAINTS	None
-DISCHARGE RATINGS	At measuring weir (March 1950)
RAINFALL/RESERVOIR RECORDS	Kept daily - Records at Pumping Station and Water Department Office

ITEM	REMARKS
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS	None
HYDROLOGY & HYDRAULICS	None
DAM STABILITY	None
SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS	None
BORING RECORDS	None
LABORATORY	None
FIELD	None
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Repairs to Spillway
HIGH POOL RECORDS	As part of daily pool records
POST CONSTRUCTION ENGINEERING	None
STUDIES AND REPORTS	Conservation Commission - Dam Report (1915)
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION	None Reported
REPORTS	Reportedly in 1955 flood, dam came within 1 foot of overtopping
MAINTENANCE	None except for cutting of vegetation
OPERATION	No operation of low level outlets for at least 24 yrs.
RECORDS	None

ITEM	REMARKS
SPILLWAY PLAN	None
SECTIONS	None
DETAILS	None
OPERATING EQUIPMENT	Water Supply lines, low level gate valves, emergency water supply siphon
PLANS & DETAILS	None

VISUAL INSPECTION CHECKLIST

APPENDIX D

VISUAL INSPECTION CHECKLIST

1. Basic Data

a. General

Name of Dam Tarrytown Water Works Hazard Category High

County Westchester ID# 54

Stream Name Unnamed Tributary of Saw Mill River

Location Westchester County Nearest Town (P.O.) Eastview

Longitude 73° 49' 55" W Latitude 41° 5' N Other Directions

Date of Insp 29 Aug Weather [illegible] Temperature 75-80

b. Inspection Personnel Glenn Gaidar - Mechanical Engineer

Harvey Feldman - Geotechnical Engineer

Team Captain Both of TAMS New York

c. Persons Contacted Mr R. Piccorelli - Tarrytown Dept. of Public Works, Pumping Station

d. History: Date Constructed 1897

Present Owner Village of Tarrytown

Designed by Board of Water Commissioners

Constructed by Van Vranken & Duell Inc

Recent History Replaced wooden flashboards w/ concrete ≈1974

2. Technical Data

Type of Dam Earth Drainage Area 896± Acres

Height 18 ft± Length 300 ft±

Upstream Slope 1V on 3H Downstream Slope 1V on 2±H

Crest Width 15 to 22 ft Freeboard at Spillway Crest 2½ ft±

Low Level Control: (Type and Size) 4-10" ϕ feeding into stilling basin 1-24" ϕ outlet

Valve Condition Unknown. last operation 24 years ago

Emergency Spillway Type (Material) Concrete & Stone Masonry Width 59 ft

Side Slopes Vertical Stone Masonry

Height (Crest to Top) 2.5 ft±

Exit Slope 1V on 8H (approx.)

Exit Length 75 ft±

Ponded Surface Area 81.2± Acres

Capacity (Normal Level) 890± Acre Feet

Capacity Emergency Spillway Level 1100± Acre Feet

3. Embankment

a. Crest

(1) Vertical Alignment Good except for rutting and one 3ft diameter depression

(2) Horizontal Alignment good

(3) Longitudinal Surface Cracks None

(4) Transverse Surface Cracks None

(5) General Condition of Surface Good except as noted above

(6) Miscellaneous Abandoned injection access shaft; 30" ϕ; no longer used. Covered with ⅜ steel plate

b. Upstream Slope

(1) Undesirable Growth or Debris Shrubs, saplings & trees
heavy growth

(2) Sloughing, Subsidence, or Depressions None except for
erosion behind gatehouse

(3) Slope Protection Riprap

(a) Condition of Riprap Good except for several locations
where stone is missing

(b) Durability of Individual Stones Excellent

(c) Adequacy of Slope Protection Against Waves and Runoff
Good

(d) Gradation of Slope Protection - Localized Areas of Fine Material
Uniform - no bedding layer

(4) Surface Cracks None

c. Downstream Slope

(1) Undesirable Growth or Debris Completely overgrown
last cutting fall of 1977

(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

None

(3) Surface Cracks on Face of Slope None

(4) Surface Cracks or Evidence of Heaving at Embankment Toe

None

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"

At maximum section, just u/s with gatehouse area, toe is soft however, local appears to be seepage but rather surface water collecting at low spot

(6) Fill Contact with Outlet Structure good

(7) Condition of Grass Slope Protection None; rather uneven, high growth to Sumac, pilox etc

d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

None

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

None

(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

None

e. Area Downstream of Embankment, Including Tailrace Channel

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

See above regarding soft spot

(2) Evidence of "Piping" or "Boils" See above

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

None

(4) Unusual Muddy Water in Downstream Channel

None

(5) Sloughing or Erosion None

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

None

(7) Stability of Tailrace Channel Sideslopes Good

(8) Condition of Tailrace Channel Riprap Bedrock

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

Waves almost non existent. Too small fetch

(10) Miscellaneous

f. Drainage System None

(1) Condition of Relief Wells, Drains and Appurtenances —

(2) Unusual Increase or Decrease in Discharge from Relief Wells

—

4. Instrumentation

None

(1) Monumentation/Surveys —

(2) Observation Wells —

(3) Weirs —

(4) Piezometers —

(Other) —

5. Reservoir

a. Slopes Appear to be stable

b. Sedimentation Indeterminate

6. Spillways

a. Principal Spillway: Inlet Condition —

Pipe Condition —

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

b. Emergency Spillway: General Condition Good except for leakage between concrete sill portion and stone masonry portion, loose & missing stones in center bottom of spillway

Tree Growth None except on R/S channel

Saplings & other vegetation

Erosion None Bedrock channel

Other Observations

7. Structural (if required) See Attached Appendix

Not Required

8. Downstream Channel

a. Condition (obstructions, debris, etc.) Heavy vegetation; some silting, little to no debris other than old concrete from flashboard sill which was removed from sill

b. Slopes N/A

c. Approximate No. Homes and Population The main water supply pumping station for the Village of Terrytown, a large corporate complex and a large utility complex are located immediately downstream

d. General

Henry S. Feldman
TEAM CAPTAIN

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX E

March 1, 1950

LOWER LAKE RECTANGULAR WEIR (5' wide) DISCHARGE
APPROXIMATE GALLONS PER 24 HRS.

Head in Inches	Gallons per 24 Hours	Head in Inches	Gallons per 24 Hours
0		7	4,662,000
1/4	32,220	1/4	4,896,000
1/2	91,620	1/2	5,148,000
3/4	168,120	3/4	5,400,000
1	257,400	8	5,670,000
1/4	360,000	1/4	5,922,000
1/2	473,400	1/2	6,192,000
3/4	595,800	3/4	6,462,000
2	725,400	9	6,732,000
1/4	865,800	1/4	7,002,000
1/2	1,013,400	1/2	7,272,000
3/4	1,166,400	3/4	7,560,000
3	1,328,400	10	7,848,000
1/4	1,495,800	1/4	8,136,000
1/2	1,670,400	1/2	8,424,000
3/4	1,854,000	3/4	8,712,000
4	2,034,000	11	9,018,000
1/4	2,232,000	1/4	9,306,000
1/2	2,430,000	1/2	9,612,000
3/4	2,628,000	3/4	9,918,000
5	2,826,000	12	10,224,000
1/4	3,042,000		
1/2	3,258,000		
3/4	3,492,000		
6	3,708,000		
1/4	3,942,000		
1/2	4,176,000		
3/4	4,410,000		

TAMS

Job No. 1487-13 Sheet 1 of _____

Project INSPECTION TARRYTOWN RESERVOIR Date Oct 5 1978

Subject Sub area C (assumed to be representative of entire drainage basin) By DLC

Ch'k. by _____

$A = 0.12 \text{ mi}^2$ $C_T = 1.5$

$L_{CA} = 1150 \text{ ft} / 0.22 \text{ mi}$ $640 C_p = 400$

$L \quad 3,700 \text{ ft} / 0.70 \text{ mi}$

$t_p = C_t (L L_{CA})^{0.3} = 1.5(0.7 \times 0.22)^{0.3}$

$= 0.86$ hours / 52 mins

$t_r = \frac{t_p}{5.5} = 0.16 \text{ hrs} / 9.4 \text{ mins}$

$q_p = \frac{C_p 640}{t_p} = \frac{400}{0.86} = 465.1 \text{ cfs/sq mi.}$

Lower Sub-basin area = 507.5 acres / 0.79 mi². Lower LAKE Area 77.8 acres

$Q_p = q_p A = (465.1)(0.79) = 367.5 \text{ cfs.}$

Upper Sub-basin area = 239.6 acres / .37 sq mi. Upper LAKE AREA 21.6 acres

$Q_p = q_p A = (465.1)(0.37) = 172 \text{ cfs}$

TAMS

Job No. 1487-13 Sheet 2 of

Project Inspection Tarrytown Reservoir Date Sep 23, 78

Subject Surcharge Storage computation By D.LC

Ch'k. by

El.	Area	Lower Mean Area	Lake Δ Vol	S.S.	Area	Mean area	Upper Δ Vol	Lake S.S	Total S.S
252	59.6			0					
		60.75	60.75						
253	61.9			60.75					
		63.05	63.05						
254	64.2			123.8					
		64.6	19.38						
254.3	65.0			143.18					
		65.7	45.99						
255	66.4			189.17					
		67.55	67.55						
256	68.7			256.72					
		69.85							
257	71.0			326.57	21.6			0	
		72.15				22.35			
258	73.3			398.72	23.1			22.35	
		74.4				23.8			
259	75.5			473.12	24.5			46.15	
		76.65				25.25			
260	77.8			549.77	26.0			71.4	
		78.9				26.75			
261	80.1			628.7	27.5			98.15	
						28.25			
262					29			126.4	
						29.7			
263					30.4			156.1	
						31.15			
264					31.9			187.25	

TAMS

Job No. 1487-13 Sheet 3. of _____

Project Inspection TARRYTOWN RESERVOIR Date Sep 23, 1971

Subject Upper lake outflow computations. By D.L.C.

Ch'k. by _____

LOCATION 73° 50' 41° 05'

Probable Maximum 6 hour Rainfall over 10 sq miles
is 26 inches

Reduced 20% ~ 20.8 inches.

Discharge capacity of dike & roadway between lakes
width of road 30 ft
length of dike 300 ft.

Assume flow over Road is critical

$$Q = 3.087 L H^{3/2} = 926.1 H^{3/2}$$

H	Q
0	0
1	926.1
2	2619.
3	4812
4	7409

Discharge Capacity of conduit below road unknown, assumed blocked during test flood

TAMS

Job No. 1487-13 Sheet 4 of _____

Project Inspection Tarrytown Reservoir Date 09-23-78

Subject Upper Lake Routing input. By DLC

Ch'k. by _____

P.M.P = 20.8 inches in 6 hours

D = ~~5 mins~~ 9.4 mins

Lake area 21.6 acres.

Hydrologic Soil Group C AMC II

Drainage Basin 50% urban development CN 88

50% Woods CN 73

Average CN 81

$$S = \frac{1000}{CN} - 10 = 2.35.$$

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} = \frac{(P - 0.47)^2}{P + 1.88}$$

Unit Hydrograph

	START	Peak	End
		57 mins	170
Time	0	~~8.6 mins~~	~~88~~ mins
Dis.	0	~~1257 cfs~~ 172	0 cfs

El	Storage	Outflow
257	0	0
258	22.35	0
259	46.15	0
260	71.4	0
261	98.15	926
262	126.4	2619
263	156.1	4812
264	187.25	7409

TAMS

Job No. 1487-13. Sheet 5 of _____

Project INSPECTION TARRYTOWN RESERVOIR Date Sep 22 1975

Subject Spillway capacity - Lower LAKE & Flow over DAM. By D.L.C

Ch'k. by _____

Spillway length 54.0' Dam length 210'

Spillway width 22" Dam width

Maximum depth to top of dam - 28"

Elev	Head	C	$Q = CLH^{3/2}$	DAM H	DAM Q	TOTAL Q
252	0					0
	0.6	2.62	65.8			65.8
253	1.0	2.69	145.			145
	1.6	2.95	322			
254	2.0	2.91	444			444
254.3	2.33	3.08	592	0	0	592
255	3.00	3.32	932	.67	356	1288
256	5.0	3.32	2004	1.67	1399	3403
258	7.0	3.32	3320	3.67	4558	7878
260	9.0	3.32	4840	5.67	8752	13592

Assume weir acts as 'sharp crested' weir above 2.75' head

Assume flow over dam critical C = 3.067

TAMS

Job No. 1487-13
Project INSPECTION TARRYTOWN Reservoir.
Subject Lower Lake ROUTING INPUT

Sheet 6. of _____
Date Sep 23, 78
By D L C
Ch'k. by _____

P.M.P. = 20.8 inches in 6 hours.

Duration ~~of 5 min~~ 0.16 hrs

LAKE AREA 77.8 acres.

Hydrologic Soil Group C AMC II

Drainage Basin 100% Woods CN 73

$$S = \frac{1000}{CN} - 10 = 3.70$$

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} = \frac{(P - 0.74)^2}{P + 2.96}$$

Unit Hydrograph

Start	Peak	End
	0.94 hrs	6 hrs
0 min	~~10.9~~ min	~~48 min~~
0 cfs	~~2192~~ cfs 367.5	0 cfs

El	Storage	Outflow
252	0	0
253	60.75	145
254	123.8	414
254.3	143.2	592
255	189.2	1288
256	256.7	3403
258	398.7	7878
260	549.8	13592

DAM INSPECTION
TARRYTOWN RESERVOIR
UPPER LAKE ROUTING
FULL PMF

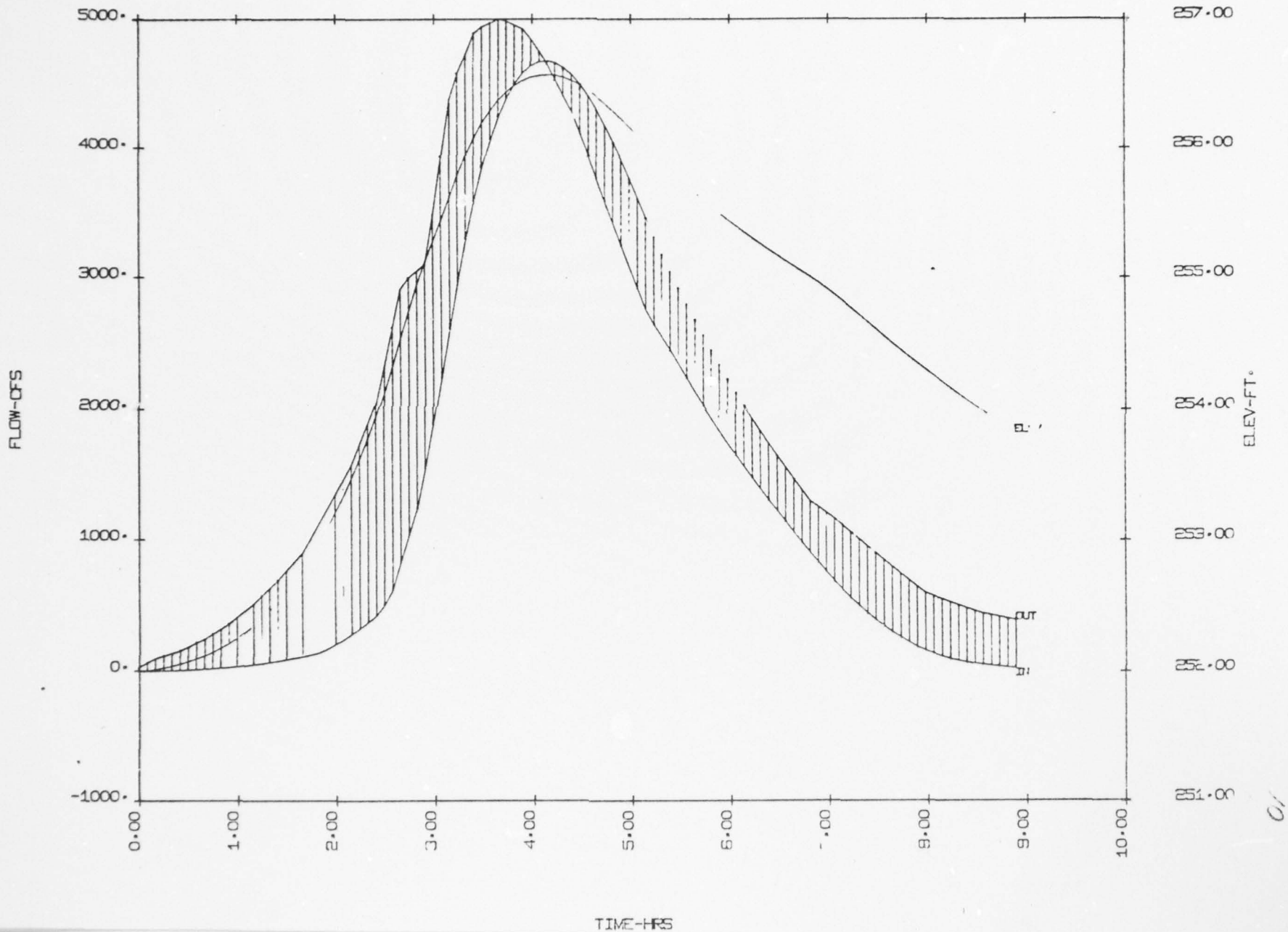
INPUT PARAMETERS

STARTING ELEV (FT.)	TIME INTERVAL (HOURS)	STARTING TIME (HOURS)	ENDING TIME (HOURS)	PRINT INTERVAL	GATE OPTION	PLOT OPTION	STORAGE COEF.	OUTFLOW COEF.	INFLOW COEF.	TIME COEF.	BREAK TIME
257.00	0.08	0.00	8.16	1	NO	NO	1.000	1.000	1.000	1.000	0.000

RESERVOIR ELEV. (FT.)	RESERVOIR STORAGE (ACFT)	RESERVOIR OUTFLOW (CFS)
257.00	0.0000	0.00
258.00	22.3500	0.00
259.00	46.1500	0.00
260.00	71.4000	0.00
261.00	98.1500	926.00
262.00	126.4000	2619.00
263.00	136.1000	4812.00
264.00	187.2600	7409.00

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
0.00	0.00	0.00	0.0000	257.00
0.08	17.44	0.00	0.0598	257.00
0.17	34.88	0.00	0.2393	257.01
0.25	41.44	0.00	0.5011	257.02
0.33	48.00	0.00	0.8078	257.03
0.41	60.35	0.00	1.1795	257.05
0.50	72.78	0.00	1.6362	257.07
0.58	86.88	0.00	2.1878	257.09
0.66	101.02	0.00	2.8243	257.12
0.75	119.33	0.00	3.5540	257.16
0.83	137.75	0.00	4.4658	257.20
0.91	157.99	0.00	5.4801	257.24
1.00	178.27	0.00	6.6334	257.29
1.08	208.19	0.00	7.9549	257.35
1.16	238.60	0.00	9.4614	257.42
1.24	291.11	0.00	11.2053	257.50
1.33	343.21	0.00	13.0722	257.58
1.41	395.58	0.00	15.0914	257.67
1.49	427.97	0.00	17.2646	257.77
1.58	460.10	0.00	19.6345	257.87
1.66	492.98	0.00	22.2074	257.99
1.74	427.41	0.00	25.0212	258.11
1.83	451.97	0.00	28.0716	258.24
1.91	514.85	0.00	31.4219	258.38
1.99	569.42	0.00	35.1407	258.53
2.07	613.94	0.00	39.1094	258.70
2.16	657.35	0.00	43.5597	258.90
2.24	726.97	0.00	48.5143	259.05
2.32	807.35	0.00	53.5605	259.20
2.41	878.05	0.00	59.3362	259.52
2.49	952.78	0.00	65.6156	259.77
2.57	1019.92	32.62	72.3426	260.03
2.66	1086.03	248.29	79.5726	260.28
2.74	1155.56	432.70	83.9999	260.46
2.82	1225.57	592.88	88.5772	260.64
2.90	1288.32	733.24	92.5818	260.79
2.99	1349.97	857.08	96.1591	260.92
3.07	1405.20	965.05	99.3023	261.04
3.15	1456.35	1142.39	101.7407	261.13
3.24	1504.40	1256.79	103.6696	261.19
3.32	1547.92	1347.56	105.1443	261.24
3.40	1575.39	1419.70	106.3811	261.28
3.49	1599.88	1476.29	107.3324	261.32
3.57	1607.03	1515.47	108.0722	261.34
3.65	1601.34	1546.76	108.5033	261.36
3.73	1592.56	1562.76	108.7919	261.37
3.82	1581.63	1571.62	108.9231	261.38
3.90	1559.57	1571.28	108.9174	261.38
3.98	1535.04	1563.20	108.7826	261.37

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
4.07	1499.56	1547.73	108.5245	261.36
4.15	1461.45	1525.08	108.1464	261.35
4.23	1419.80	1496.62	107.6716	261.33
4.32	1377.30	1463.57	107.1202	261.31
4.40	1335.33	1425.74	106.4989	261.29
4.48	1270.92	1382.74	105.7713	261.26
4.56	1217.16	1336.00	104.9914	261.24
4.65	1163.58	1286.92	104.1725	261.21
4.73	1107.73	1235.95	103.3220	261.18
4.81	1051.27	1183.23	102.4423	261.15
4.90	997.66	1129.73	101.5495	261.12
4.98	944.90	1076.38	100.6586	261.09
5.06	895.20	1023.67	99.7799	261.05
5.15	846.49	972.17	98.9205	261.02
5.23	803.55	923.95	98.0909	260.99
5.31	762.46	879.16	97.2303	260.96
5.39	726.61	862.53	96.3167	260.93
5.48	692.55	830.21	95.3828	260.89
5.56	661.65	797.84	94.4490	260.86
5.64	631.89	765.91	93.5256	260.82
5.73	607.65	735.02	92.6333	260.79
5.81	585.40	705.75	91.7876	260.76
5.89	550.56	676.63	90.9464	260.73
5.98	510.89	645.79	90.0556	260.69
6.06	483.58	614.39	89.1485	260.66
6.14	461.32	584.39	88.2918	260.63
6.22	434.56	555.97	87.4609	260.60
6.31	415.60	528.73	86.6739	260.57
6.39	391.28	502.25	85.9089	260.54
6.47	366.37	476.16	85.1553	260.51
6.56	340.02	450.17	84.4045	260.49
6.64	313.00	424.03	83.6485	260.45
6.72	285.80	397.69	82.8885	260.42
6.81	258.52	371.16	82.1220	260.40
6.89	233.40	344.70	81.3576	260.37
6.97	209.32	318.63	80.6045	260.34
7.05	187.27	293.19	79.8698	260.31
7.14	166.25	268.58	79.1589	260.29
7.22	147.07	244.93	78.4755	260.26
7.30	129.83	222.32	77.8225	260.24
7.39	112.31	200.81	77.2010	260.21
7.47	96.72	180.46	76.6131	260.19
7.55	82.58	161.26	76.0596	260.17
7.64	69.25	143.22	75.5375	260.15
7.72	57.48	126.34	75.0499	260.13
7.80	46.58	110.64	74.5961	260.11
7.88	37.10	96.10	74.1761	260.10
7.97	28.47	82.71	73.7895	260.09
8.05	21.21	70.48	73.4361	260.07
8.13	14.80	59.39	73.1157	260.06
MAX. VALUES	1603.03	1571.62		261.36


5000.
4000.
3000.
2000.
1000.
0.
-1000.
FLOW-CFS
257.00
256.00
255.00
254.00
253.00
252.00
251.00
ELEV-FT.
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
TIME-HRS

DAM INSPECTION
TARRYTOWN RESERVOIR
LOWER LAKE ROUTING
FULL PMF

INPUT PARAMETERS

STARTING ELEV (FT.)	TIME INTERVAL (HOURS)	STARTING TIME (HOURS)	ENDING TIME (HOURS)	PRINT INTERVAL	GATE OPTION	PLOT OPTION	STORAGE COEF.	OUTFLOW COEF.	INFLOW COEF.	TIME COEF.	PEAK TIME
252.00	0.08	0.00	9.00	1	NO	YES	1.000	1.000	1.000	1.000	0.000

RESERVOIR ELEV. (FT.)	RESERVOIR STORAGE (ACFT)	RESERVOIR OUTFLOW (CFS)
252.00	0.0000	0.00
253.00	60.7500	145.00
254.00	123.8000	444.00
254.30	143.0000	592.00
255.00	189.2000	1258.00
256.00	256.7000	3403.00
258.00	394.7000	7878.00
260.00	549.8000	13592.00

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
0.00	0.00		0.0000	252.00
0.08	73.19	0.26	0.1122	252.00
0.17	66.39	1.07	0.4439	252.00
0.25	99.59	2.40	1.0073	252.01
0.33	119.67	4.14	1.7769	252.02
0.41	139.59	6.18	2.5907	252.04
0.50	159.51	8.51	3.5662	252.05
0.58	179.15	11.20	4.6644	252.07
0.66	219.03	14.33	6.0078	252.09
0.75	248.91	17.90	7.5012	252.12
0.83	287.43	21.96	9.2040	252.15
0.91	326.28	26.59	11.1423	252.19
1.00	365.12	31.77	13.2134	252.21
1.08	415.34	37.59	15.7522	252.25
1.16	466.14	44.14	18.4651	252.30
1.24	516.93	51.41	21.5390	252.35
1.33	575.15	59.45	24.9079	252.41
1.41	633.91	68.32	28.6266	252.47
1.49	695.67	78.02	32.6916	252.54
1.58	763.44	88.60	37.1744	252.61
1.66	831.83	100.12	41.9484	252.69
1.74	900.23	112.56	47.1594	252.77
1.83	1004.14	126.22	52.6855	252.87
1.91	1119.69	141.45	58.2652	252.97
1.99	1231.24	171.14	64.2426	253.08
2.07	1344.29	206.88	73.7999	253.29
2.16	1457.50	245.10	91.1585	253.65
2.24	1570.72	285.71	90.4252	253.47
2.32	1725.66	324.32	99.6187	253.61
2.41	1885.69	376.57	109.5436	253.77
2.49	2045.71	427.44	120.3680	253.94
2.57	2322.92	507.36	132.1055	254.12
2.66	2615.97	622.27	145.2407	254.35
2.74	2909.13	533.26	159.1459	254.54
2.82	2993.21	1042.05	172.9450	254.74
2.90	3045.33	1236.97	185.9277	254.94
2.99	3097.46	1546.10	197.4772	255.12
3.07	3486.95	1863.79	208.2147	255.29
3.15	3873.49	2237.02	219.4990	255.44
3.24	4330.02	2608.29	231.2872	255.62
3.32	4550.18	2970.30	242.4605	255.79
3.40	4734.56	3294.52	253.3637	255.94
3.49	4888.94	3590.61	262.5535	256.09
3.57	4979.28	3847.90	270.1476	256.19
3.65	4968.50	4042.90	277.6400	256.29
3.73	4997.71	4241.79	283.3164	256.37
3.82	4977.97	4356.82	287.9115	256.43
3.90	4947.43	4498.77	291.4708	256.48
3.98	4915.80	4582.02	294.1442	256.52

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
4.07	4335.97	4640.05	295.9541	256.55
4.15	4743.01	4669.10	296.8759	256.64
4.23	4650.05	4674.43	297.0450	256.66
4.32	4527.79	4657.81	296.5175	256.59
4.40	4397.98	4614.91	295.3150	256.54
4.48	4268.17	4564.15	293.5456	256.51
4.56	4104.82	4490.74	291.2170	256.49
4.65	3892.19	4398.63	288.3029	256.44
4.73	3760.55	4291.42	284.8612	256.39
4.81	3516.91	4171.25	281.0778	256.34
4.90	3414.27	4040.57	276.9408	256.27
4.98	3241.63	3902.28	272.5430	256.22
5.06	3076.55	3757.80	267.9526	256.15
5.15	2913.47	3609.55	263.2764	256.09
5.23	2751.19	3458.50	258.4613	256.04
5.31	2633.10	3310.51	253.7411	255.99
5.39	2541.82	3171.15	249.3107	255.95
5.48	2445.54	3040.13	245.1191	255.91
5.56	2341.46	2915.07	241.1279	255.87
5.64	2234.55	2793.80	237.2575	255.83
5.73	2127.65	2675.30	233.4757	255.79
5.81	2026.51	2559.61	229.7532	255.75
5.89	1927.57	2446.94	226.1875	255.71
5.98	1828.64	2336.92	222.6764	255.67
6.06	1736.07	2229.67	219.2534	255.63
6.14	1646.10	2125.51	215.9491	255.59
6.22	1556.13	2024.09	212.7923	255.56
6.31	1469.63	1925.22	209.7369	255.53
6.39	1384.44	1828.99	206.8426	255.50
6.47	1299.65	1734.75	203.9852	255.47
6.56	1217.45	1642.70	201.3202	255.44
6.64	1137.51	1552.76	198.7646	255.42
6.72	1057.16	1464.63	196.3769	255.39
6.81	979.26	1378.34	194.0872	255.37
6.89	902.59	1293.74	191.9454	255.35
6.97	825.90	1208.66	189.8013	255.33
7.05	754.71	1208.49	187.8148	255.31
7.14	695.11	1155.27	186.0479	255.29
7.22	617.92	1106.21	184.4179	255.27
7.30	556.44	1055.05	182.8128	255.25
7.39	499.67	1003.04	181.3670	255.24
7.47	443.90	950.47	180.0095	255.22
7.55	399.91	897.73	178.8463	255.21
7.64	342.77	845.34	177.9440	255.20
7.72	295.43	797.47	177.2159	255.19
7.80	255.74	742.41	176.6469	255.18
7.88	219.15	682.61	176.2466	255.17
7.97	182.97	614.15	176.0449	255.17
8.05	154.03	537.30	176.0507	255.17
8.13	132.02	471.64	176.2324	255.17

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
8.22	109.12	542.65	137.5173	254.21
8.30	91.80	525.40	134.5225	254.16
8.39	79.19	503.32	131.5766	254.12
8.47	64.56	481.30	128.6899	254.07
8.55	54.88	459.81	125.8725	254.03
8.63	47.91	440.87	123.1409	253.98
8.71	40.94	428.19	120.4652	253.94
8.80	34.35	415.68	117.8285	253.89
8.88	28.04	403.38	115.2345	253.84
8.96	21.74	391.26	112.6801	253.79
MAX. VALUES	4997.71	4674.43		256.56
MIN. VALVES	0.00	0.00		252.00

DAM INSPECTION
TAPPYTOWN RESERVOIR
LOWER LAKE ROUTING

HALF PMF

INPUT PARAMETERS

STARTING ELEV (FT.)	TIME INTERVAL (HOURS)	STARTING TIME (HOURS)	ENDING TIME (HOURS)	PRINT INTERVAL	GATE OPTION	PLOT OPTION	STORAGE COEF.	OUTFLOW COEF.	INFLOW COEF.	TIME COEF.	BREAK TIME
252.00	0.08	0.00	9.00	1	NO	YES	1.000	1.000	0.500	1.000	2.000

RESERVOIR ELEV. (FT.)	RESERVOIR STORAGE (ACFT)	RESERVOIR OUTFLOW (CFS)
252.00	0.0000	0.00
253.00	60.7200	145.00
254.00	123.8800	444.00
254.30	142.2000	522.00
255.00	189.2700	1284.00
256.00	254.7000	3407.00
258.00	396.7000	7975.00
260.00	549.4000	13592.00

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
0.00	0.00	0.00	0.0000	252.00
0.08	15.59	0.13	0.6564	252.00
0.17	33.19	0.53	0.2746	252.00
0.25	49.79	1.20	0.5026	252.01
0.33	66.83	2.07	0.5424	252.01
0.41	83.79	3.09	1.2653	252.02
0.50	99.75	4.25	1.7831	252.02
0.58	114.67	5.60	2.3472	252.03
0.66	109.51	7.16	3.0074	252.04
0.75	124.55	8.95	3.7556	252.05
0.83	148.71	10.96	4.6020	252.07
0.91	163.14	13.20	5.5711	252.09
1.00	192.56	15.64	6.6647	252.11
1.08	217.27	18.30	7.9701	252.12
1.16	235.07	21.07	9.2475	252.15
1.24	256.46	23.70	10.7406	252.17
1.33	288.07	26.72	12.4539	252.20
1.41	317.95	30.16	14.3437	252.23
1.49	347.63	34.01	16.3456	252.26
1.58	381.72	38.35	18.5622	252.30
1.66	415.61	44.36	20.6742	252.34
1.74	452.11	50.04	23.1797	252.38
1.83	494.67	54.28	26.4427	252.43
1.91	550.84	63.11	29.6326	252.48
1.99	615.42	70.72	33.1501	252.54
2.07	672.14	78.12	36.9025	252.60
2.16	731.75	86.29	41.1174	252.67
2.24	790.26	95.27	45.6758	252.75
2.33	863.83	103.93	51.5055	252.84
2.41	942.04	120.54	55.3280	252.91
2.49	1022.05	137.25	61.6060	253.01
2.57	1101.41	149.05	67.9710	253.11
2.66	1207.98	179.24	75.0644	253.22
2.74	1454.56	213.02	82.9761	253.35
2.82	1806.20	250.41	91.2479	253.48
2.90	1582.66	290.62	99.4119	253.61
2.99	1564.73	327.30	107.6002	253.74
3.07	1742.47	401.27	116.2600	253.88
3.15	1726.74	440.91	126.0168	254.03
3.24	1703.01	547.57	137.9765	254.20
3.32	2240.09	666.49	148.1229	254.37
3.40	2367.28	830.35	158.9650	254.53
3.49	2444.47	965.67	169.2164	254.69
3.57	2469.14	1158.72	179.5013	254.85
3.65	2464.25	1267.43	187.6716	255.00
3.74	2469.25	1477.97	195.2051	255.11
3.82	2469.99	1675.26	201.5566	255.22
3.90	2473.71	1821.16	208.5750	255.35
3.99	2467.44	1952.65	210.4739	255.31

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
4.07	2417.98	2047.61	213.4429	255.35
4.15	2371.50	2114.74	215.5955	255.39
4.23	[illegible]	2159.90	217.0262	255.41
4.32	2263.89	2185.93	217.6573	255.42
4.40	2198.99	2194.73	218.1392	255.42
4.48	2174.09	2189.27	217.9642	255.42
4.56	2052.41	2170.70	217.3714	255.41
4.65	1965.09	2139.40	216.3749	255.40
4.73	1879.77	2097.60	215.0393	255.37
4.81	1797.45	2047.12	213.4274	255.35
4.90	1707.13	1989.71	211.5953	255.33
4.98	1620.81	1926.72	209.5847	255.30
5.06	1515.27	1859.57	207.4418	255.27
5.15	1456.93	1789.57	205.2076	255.23
5.23	1375.59	1717.37	202.9034	255.20
5.31	1313.05	1645.30	200.4193	255.16
5.39	1270.91	1577.95	198.4532	255.13
5.48	1222.17	1512.91	196.4162	255.10
5.56	1170.73	1452.57	194.4525	255.07
5.64	1117.27	1392.90	192.5479	255.04
5.73	1067.82	1334.42	190.6817	255.02
5.81	1013.25	1282.65	188.8429	254.99
5.90	963.75	1253.63	186.9321	254.96
5.98	914.32	1222.66	184.5821	254.93
6.06	868.03	1189.98	182.7223	254.90
6.14	824.05	1156.03	180.4799	254.86
6.22	771.06	1120.95	178.1619	254.83
6.31	734.81	1095.65	175.7867	254.79
6.39	687.32	1048.42	173.3663	254.75
6.47	649.32	1011.22	170.9076	254.72
6.56	609.92	973.58	168.4196	254.68
6.64	564.75	935.65	165.9128	254.64
6.72	526.59	897.50	163.3914	254.60
6.81	438.44	859.21	160.8608	254.57
6.89	451.29	820.89	158.3279	254.53
6.97	412.95	782.36	155.7949	254.49
7.06	377.75	744.37	153.2707	254.45
7.14	343.15	706.50	150.7679	254.41
7.22	304.96	669.00	148.2891	254.37
7.30	274.22	631.99	145.8431	254.34
7.39	249.33	595.69	143.4440	254.30
7.47	220.45	575.54	141.0430	254.26
7.55	194.95	556.79	138.5947	254.22
7.64	171.35	537.74	136.0877	254.19
7.72	147.81	518.46	133.5606	254.15
7.80	127.67	499.05	131.0162	254.11
7.88	109.57	479.65	128.4737	254.07
7.97	91.48	460.32	125.9403	254.03
8.05	77.46	442.23	123.4269	253.99
8.13	66.01	430.37	120.9264	253.95

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT.)
8.22	24.56	418.52	118.4247	253.91
8.20	45.90	406.74	115.0430	253.87
8.30	30.00	395.09	113.4347	253.83
8.47	29.29	383.57	111.0541	253.79
8.55	27.44	372.25	108.6719	253.74
8.63	25.05	361.16	106.3329	253.72
8.71	20.47	350.31	104.0453	253.69
8.80	17.17	339.70	101.8060	253.65
8.88	14.02	329.33	99.6206	253.61
8.96	10.87	319.19	97.4818	253.58
MAX. VALUES	2494.95	2194.73		255.42
MIN. VALVES	0.00	0.00		252.00